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INDEX TO TELEGRAPH AND TELEPHONE AGE

JANUARY 1 TO DECEMBER 16, 1921

A

An Appreciation of Thomas Ahearn of Ottawa, Ontario.. 222
A Problem in Electrical Engineering to the Editor of Telegraph and Telephone Age 213
Annual Meeting of the American Telephone and Telegraph Company 168
American Telephone and Telegraph Company's Annual Report 133
Another Western Union Telegraph Co. 532, 546
Annual Report of the Telegraphy and Telephony Committee, American Institute of Electical Engineers 316
Appealing to Voters by Radio.. 532
Asylums a Necessity 384
A Sure Way to Sell Bonds..... 384
Associated Press...144, 151, 341, 483
A True Prophecy 106
At What Age Are You Most Fit 306
Automatic Train Control..... 527
A Toast to a Good Man..... 24

Authors

Achimore, A. P., To Enter Business Field 387
Albright, J. E. Semi-Automatic Sending Keys 111
Alexanderson, E. F. W. Central Stations for Radio Communication 3
Atwell, R. L. Application of Wired Wireless, Radio and Wireless Telephone to Railway Service Communication Systems 55
Bates, David Homer. Longitudes on Baltimore and Ohio Railroad 468
United States Military Telegraph Pension Bill 311
A War Episode 567
Beach, S. W. United States Navy's Communication Systems in France 364
Blake, E. The Alexanderson High Frequency Alternator... 79
Booth, A. C. Telegraph Keyboard Perforators 368
Brickhouse, T. S. Extensive Private Wire Telegraph System 52
Brickhouse, Thos. The Back Stage Side of the Wire Business 330
Bright, Sir Chas., F.R.S.E., M.Inst.C.E., F.R.A.S., M.I.E.E. Future of the Cables 66
Brown, J. Some Phases of Railroad Telegraph and Telephone Engineering 526
Bullard, Rear Admiral W. H. G. Washington-Greenwich Longitude 443, 519
Weather Reports 391
Casper, Louis. Student's Course in Technical Telegraphy...17, 41, 64, 80, 105, 130, 155, 180, 204, 251, 276, 299, 323, 347, 371, 395, 419, 437, 472, 495, 520, 544, 569
Colpitts, E. H., and Blackwell, O. B. Carrier Current Telephony and Telegraphy...112, 125, 150, 178, 194, 218, 242, 266, 290, 444
Cottrell, Arthur E. Sunspots and Magnetic Storms..... 465
Crawley, Lt.-Col. C. G. Wireless Waves 128
Wireless Telegraphy 463
de La Motte, Wm. The History of Vessel Reporting at Sandy Hook 229
Duncan, R. D. Recent Attainments in Wired Radio.....74, 75, 98, 122, 146, 173, 196
Easson, Robert F. Old Time Telegraph Reminiscence...320, 343
Ellis, Robert. Plain Tales of the Telegraph Line. How Jenser Gave the Gang a Day Off.... 126
When O'Toole Slipped Up With the Shovels 152
Ignominious Rout of the Growler Gang 235
Gulick, C. W. History of the Morse Statue in Central Park 446
Hanson, Earl C. Telephone Hearing 154
Hutchens, H. E. Old Time Reminiscence 415
Howell, J. Frank. Canada a Wonderland 345
The Late R. H. Bohle 582
Herring, Carl. Revision of Some of the Electromagnetic Laws. 536
Hershey, H. E. Automatic Telephone Practice 148, 170, 198, 224, 245, 268, 294, 314, 338, 362, 386, 410, 436, 462, 486, 515, 534
Horn, John. History of the Morse Statue in Central Park, 247, 274
Hulatt, H. Railway Time Service 138, 176, 201
Hurley, Edward N. Pertinent Points on Government Ownership 394
Jones, J. Rymer. Submarine Cable Tests 392
Mackay, Clarence H. Ladders to Climb 538
The German Cables..... 57
MacFarlane, L. H. The Old Time Telegrapher 301
McMillan, J. Observations While Abroad 471
Maver, Wm., Jr. Some Phases of Railroad Telegraph and Telephone Engineering, 283, 477, 501
Morehouse, H. W. Hearts Content Cable Station 28
Moseley, Mercer P. Work 32
McGuinness, W. V. New Western Union Office at Memphis. 379
Plausics, A., Jr. New Western Union Offices at Salt Lake City, Utah 421
Pillsbury, E. B. Wireless Telegraphy 489
Rhoads, Stanley. Some Phases of Railroad Telegraph and Telephone Engineering ...113, 549
Robeson, Daniel S., Line Constructor 468
Shaughnessy, E. H. The Use of a Spacing Wave in Continuous Wave Wireless Telegraphy 259
Stumm, Frank A. Military Telegraph Pension Measure 76
Thompson, B. F. The Advantages of Telephone Train Dispatching on Railroads 5
Tesla-Nikola. Developments in Practice and Art of Telephotography 296
Tierney, P. J. The Telegrapher's Opportunity 558
Tarrisse, Edwin. According to the Code 223
Thurber, H. B. Courtesy..... 315
Viles, Frank T., Becomes Forty-Niner of the Telegraph 441
Ward, J. C. Taught Edison Telegraphy 307
Whalen, J. J. Praise for the Plant Department 580
Welch, E. W. The Great Pre-War World Wireless Scheme of Germany 102
Weller, S. F. Improving the Telegraph Service 521
Weller, Chas. E. Wireless Telegraphy Discovered and Successfully Demonstrated by an American Before Marconi Was Born 537
Williams, F. H. Make the Workrooms Attractive 202

B

Bates, Davis Homer, Resigns... 366
Broad Street, New York, as a Cable and Radio Center..... 212
Brooke, Thomas H. Sixty-two Years in the Service 261
Bright, Sir Charles, and Partners. Personnel of the New Firm 542
Brazilian Telegraphs 469
Bell, Dr. Alexander Graham.... 67

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INDEX

BIOGRAPHICAL

Clark, A. J. 407
Clayton, Ernest W. 94
Coady, John P. 60
Dyer, Eugene L., Retirement... 566
Gegou, Jean 31
Mackenzie, Major Cecil W..... 539
McMillan, Daniel 53
Perry, Geo. D. 55
Newton, Edward C. 419
Sunny, B. E. 494
Sweeney, E. C. 31
Williams, W. R. 165

C

Civil War Military Telegraphers in Bronze 197
Conference on Inductive Interference 258
Communication Restored as Gun Fires Wire Over River..... 543

Cable

Cable, The 455
All America Cables.....16, 43, 71, 119, 166, 191, 216, 229, 264, 287, 311, 334, 355, 382, 408, 432, 455, 483, 497, 531, 540, 577
Annual Report of the Pacific Cable Board 89
Barbados Western Union Cable, 35, 166
Cable Situation 59
Cunningham, Alexander. Locating Faults in Submarine Cables 564
Cable Connections in Mexico Needed 250
Cuban Telephone Cables 40, 77, 137
Concerning the Prepayment of Cable Messages 29
Considers New Cable Law..... 278
Commercial Cable Company News Items 166, 190, 262, 405, 430, 580
Direct United States Cable is Bought by Great Britain..... 161
French Cable Staff Honors Retiring Officials 432
German Cables 483, 158
Government Views on New Pacific Cables 398
International Communications Conference 35, 398
Island of Yap 71, 134, 434
Land Cable Laying by Aeroplane 154
Longest Underground Telegraph and Telephone Cable System.. 59
President to Be Given Control of Cable Landings 233
Question of Mandates and Cables Interwoven 116
Submarine Cable. News Notes, 16, 43
Submarine Cable Developments in Italy 540
Salvaged Old Submarine Cable.. 31
St. Pierre Western Union Cable Station 203
Telephone Cable Connecting Key West and Havana 127

Canada

Canadian National Telegraphs, 19, 72, 94, 144, 168, 192, 212, 263, 287, 407, 508, 530, 557
Canadian Notes 434, 557, 582
Montreal Telegraph Company's Annual Meeting 95
Rough it in Canada 288

D

Delivering Messages with Obscure or Uncertain Addresses. 389
Description of Ribohm 234
Diaphragm Sounders Are Efficient 88
Dot and Dash Club of Philadelphia 140, 227
Dyke's Automatic Electric Buoy Lamp 188

E

Electrical Review Changed Ownership 572
Edison, Thomas E., 82, 106, 230, 408, 474
Electrical Facts Worth Remembering 236
Electric Batteries Reverse Voltage at Low Temperatures.... 556
Electrical Aid Society of Philadelphia 33, 187
Earth Boring Machine..... 253
Epitome of Progress in Electrical Science in Europe..... 341
Emancipation Proclamation..... 179
Evolution of Signs, Signals and Signalling 370

Editorial

An Inspiration for President Harding 158
Aurora Borealis 134
Amplifying the President's Voice 207
American Radio Relay League at Chicago 422
American Telephone and Telegraph Company's Report..... 498
American Telephone and Telegraph Aerial Cable Connecting New York and Chicago..... 474
Big Price Paid for a Small Ill-Gotten Gain 374
Difficulties of Conducting Trade Papers Multiply 302
Electron Theory of Matter..... 134
Enjoyment of Knowledge..... 82
Faith is in Wireless for Long Distance Telephone 254
Four Countries to Develop World's Radio Facilities..... 474
French Cable Co. and Wireless Interests 522
German-English-American Patent Agreement 374
General Situation 398
Inductive Disturbance in Communication Circuits Originating in Neighboring Electric Power Lines 9
Institute of Radio Engineers Standardization Committee.... 374
Institution of Post Office Electrical Engineers 522
Increase in Cost of Telegraph Materials 10
Loyalty 254, 274
Large Gathering of Telegraph and Telephone Engineers..... 108
Lawton, Old Farmer..... 36
McNicol, Donald, Resigns Editorship of TELEGRAPH AND TELEPHONE AGE 9
Market Reports by Radio..... 302
Motor Pole Raising..... 206
Morse Alphabet for Radio Telegraphy 9
Ownership Statement 182, 448
President Harding on Radio and Cables 182
Public Holding Back Their Purchases 374
Pension Bill for the Relief of United States Military Telegraphers 254
Spell Correctly 498
Telegraph Convention, a Proposed 10
Thought for 1921 36
Telegraph and Telephone in China 278
Value of Courtesy..... 108
Vail, Theodore N., Advent Into the Telephone 448
Young Men 422

F

Famous Morse Elm Removed... 246
First Telegraph Line in Cleveland 384
Familiar Name Disappears. G. N. W. to Canadian National Telegraphs 51
French Wire Service in Poor Condition 48
Flashlight Telegraph Service.... 572
Fundamentals of Engineering Success 27
Fleming, Dr. John Ambrose, F.R.S. 367

G

Good-Bye, My Pal..... 90
German Telegraph and Telephone Service 172

H

Hotchkiss, Horace L., Honored. 77

I

International Association of Municipal Electricians 403
International Telegraphic Conference at Riga..... 542
Institute of Radio Engineers.. 71

J

Jimmy, Mascot of Messenger Boys, Laid to Rest in Grave Under Elm Tree 261

K

Kleinschmidt Printing System.. 447

L

Louisville and Nashville Railroad Right of Way....82, 543, 576
Life Insurance Association for Telegraphers 84

Digitized by Google

INDEX

M

Magnetic Storms—Their Effects Upon Railway Signal and Telegraph Apparatus 443
Magnetic Club Dinner.....237, 510
Mackay Company's Annual Report 107
Morse Code Taps Save Life of Man in Vault 60
Misunderstanding of Orders.... 96

N

New Zealanders Greatest Telegraph Users 8
National Electrical Code..... 70
New York Telegraphers' Aid Society 186, 505, 531

O

Old Time Telegraphers' and Historical Association.....144, 167, 186, 207, 250, 349, 460, 470, 492, 568
Origin of the Symbol "O. K."..366
Observations from China..... 383

Obituary

Adams, Captain James..... 36
Atwater, H. H. 187
Alden, Edward 24
Armstrong, E. N. 373
Austin, W. A. 483
Bradley, Chas. W. 63
Boyd, Jos. W..... 187
Burts, S. L. 96
Barber, C. T. 373
Bragg, Lester B. 429
Bohle, R. H. 555
Chatman, A. C., Jr..... 24
Coapman, E. H. 39
Colton, S. F. 120
Colestock, D. E. 88
Candee, Wm. L. 240
Cox, Dr. Harry B. 330
Crocker, Prof. Francis B..... 330
Chenery, E. A. 525
Carroll, W. J. 531
Cooke, E. C. 531
Chittenden, W. G. 531
Carroll, J. J. 581
Duncan, S. A. 24
Doolittle, T. B. 187
Dulin, W. E. 531
Doran, John 579
Frost, Cloys M..... 167
Foster, W. J. 167
Griffin, S. L. 139
Groce, G. H. 330
Gaines, John D. 405
Holligan, Wm. R. 139
Henning, Thos. 139
Hotchkiss, Mrs. C. T. 120
Hill, T. W. 240
Howard, E. A. 240
Hudson, E. E. 305
Hewitt, Peter 405
Ives, W. L. 272
Jones, F. M. 24
Korty, L. H. 257
Marshall, W. J. 167
Morehouse, Dr. J. T. 33
Mulcahy, R. E. 373
Milliken, G. F. 508
McGuire, J. H. 531
Masten, A. E. 582
McArdle, Arthur 408
Osgood, Jenny 483
O'Reilly, M. J. 557
Pickernell, Frank A. 96
Pfund, Richard 139
Pryor, B. A. 558
Rawson, H. E. 69
Reese, S. W. 69
Roebling, Karl G. 282
Reilly, J. F. 311
Reeves, Elwood Franklin..... 330
Rand, David E. 373
Rolfe, W. H. 558
Shepard, D. P. 24
Shain, H. 139
Smith, A. B. 94
Smith, Isaac 263
Smith, M. H. 120
Sunderland, M. J. 24
Schoenmehl, C. B. 120
Smith, T. H. 373
Supple, Jos. G. 429
Smith, G. O. 558
Thompson, E. B. 139
Taylor, Albert 355
Upton, Francis R. 139
Varley, S. A. 558
Warren, C. P. 167
Wortsman, L. W. 120
Wallick, J. F. 529
Zion, A. A. 558

P

Postal Telegraph-Cable Company, News Items..20, 44, 68, 90, 117, 140, 162, 190, 214, 238, 262, 284, 308, 332, 356, 380, 404, 430, 456, 481, 504, 527, 553, 579
Pueblo Phone Girls Perform Heroic Duty 293
Put Your House in Order..... 161
Publisher's Son "Cubbed It".... 192
Pulpit and the Electrical Industry 346
Primary Battery, An Improvised 10
Pacific Coast Talk is Heard in Spain 70
Parker, Orville D., Golden Anniversary 555

Personal

Alexanderson, E. F. W. 44
Brickhouse, Thos. S....308, 356, 481
Bahnson, Capt. J. J..... 380
Bristol, C. H..... 579
Clowry, Col. R. C..... 91
Collette, N. T. 430
Case, J. G. 430
Carr, J. O. 481
Courter, Norman C. 44
Cogley, E. W. H..... 68
Chow, K. P. 284
Coady, J. P. 284
Doherty, W. J. 23
Delany, P. B. 504
Estaugh, E. 141
Fleming, Thos. E. 44
Fuller, J. Conrad..... 111
Fleming, Mrs. T. E. 480
Finley, J. H. 579
Ghegan, J. J. 117
Gulick, C. W. 284
Gellatly, Wm. 356
Holligan, W. R. 117
Hackett, F. C. 456
Howell, J. Frank 117, 284
Hough, Mrs. Maude C. 214
Hagen, J. C. 238
Hayes, J. G. 238
Hutchens, Henry E. 553
Jewett, F. B. 214
Joyce, E. M. 44
Jones, Walter L. 284
Johnson, R. H. 553
Lockwood, A. 579
Martin, Horace G. 91
Maver, Wm., Jr. 214
McIntosh, L. C. 141
McFarlane, E. R. 308
McMillan, J. 332, 456
Mudgett, G. A. 430
Miller, I. N. 527
McNicol, Donald 190
Noss, M. A. 404
Ruberg, M. 332
Rosenbaum, W. A. 527
Russel, Col. Edgar 553
Robeson, D. S. 553
Sunny, B. E. 68
Squier, Major-General G. O..... 284
Solorvano, Paulino 380
Scott, John R. 68
Simon, A. 141
Tevis, R. 68
Tarkington, H. W. 430
Weir, A. S. 579
Young, R. N. 15
Yagi, Shojiro 553
Umfred, Alfred 380

R

Roebling, Colonel, Heads Company at Eighty-four 282
Electrical Disturbances 244, 273
Reliable Protection Products Produced in New Factory.... 211
Regret French Wire Delay..... 76
Recollection of an Old Timer by One of Them 411
Root of Efficiency. By an Official 433

Radio

Amateur Radio League Opposes Regulation Bill 113
American Radio Relay League.. 23
Application of Radio to Navigation Problems 336
British Empire Radio Development 383, 394
British Marconi ...209, 366, 405, 391
Censorship Off News Sent Over Naval Wireless 211
China to Issue Bonds for Radio Stations 447
Central Stations for Radio Communication. By E. F. W. Alexanderson 3
Contract for Poland Radio Consummated 383
Concerts by Radio Telephony... 221
Duplex Wireless Telephony and Selective Reception 34
Daily News and Concerts by Radio Telephone 484
Distribution of Radio Literature 379
Future of Radio Telegraphy.... 157
French to Control Wire and Radio System in Ecuador..... 315
Government Control of All Wireless 389

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INDEX

German Wireless Telegraphy and Telephony 34, 179, 395
International Radio Telegraph Company 312, 334, 359, 382
Intercity Radio Company.....12, 543
Installation of Wireless Stations in Venezuela 88
Imperial Wireless Scheme..... 565
Judge Mayer Sustains Armstrong Radio Patent 249
May Connect Washington with Shanghai by Radio 104
Marconi Wireless Telegraph Company of Canada...70, 312, 471
Message by President-Elect Harding for Radio Competition 89
New Radio Record..... 167
New Radio Device Records Signals Autographically 174
Nally, E. J., Elected Vice-President Marconi Sports Club of London 578
New Radio Station in Switzerland 175
New Type Radio Transmitter... 67
Observe Effects of Eclipse on Radio Signals 390
Opening of "Radio Central" Marks New Era in World Communication 512
Origin and Development of Radio Service in America, 54, 413, 439, 464
Prescribed by Radio 189
Place of Radio in the Communication Field 560
President Harding to Address the World by Wireless..... 508
Quotation Relative to Radio Laws 30
Radio to Report Future Events. 349
Radio Corporation of America Buys International Radio Telegraph Assets 422
Radio Phenomena 113
Radio Links France with United States 70
Radio Transmits Photographs Over Ocean 384
Reporting the Big Scrap by Wireless Telephone 331
Radio Aurora Proof 264
Radio Signals from Mars..... 417
Radio Station in Poland..... 139
Radio Expert Forecasts Transocean Telephony 111
Radio Tournament 434
Radio Device Will Guide Ships Safely Through Fog 151
Radio Telegraph News Items, 11, 43, 70, 88
Radio Club of America 12
Radio Corporation of America, 89, 119, 144, 167, 191, 216, 227, 264, 287, 312, 334, 355, 383, 408, 432, 455, 482, 507, 529, 555, 577
Success of Wireless Telephony.. 568
Ship's S. O. S. Laid to a Radio Joker 88
Seutter's Radio Score Perfect... 473
To Urge Increased Communication With Australia 312
United States Tests British Claim to Wireless Monopoly in China 134
Universal Radio System Links Paris With Britain 107
Wireless as a Hobby. By L. M. Dunnam 7
Westinghouse to Cover United States by Wireless 578
Wireless Station for Bowman Hotels 466
Wireless Fog Signals to Be Installed at Entrance to New York Harbor 211
Wireless Telegraphy in France, Germany and the United States 388
Wireless Wheatstone Trials..... 219
Wireless News and Propaganda 393
Vaudeville by Radio Telephony. 179
Variation of Radio Signals..... 277

Railroad

Railroad, The.....14, 38, 62, 87, 111, 137, 161, 185, 209, 233, 257, 281, 329, 353, 377, 400, 425, 451, 477, 501, 525, 549, 575
American Railway Association and the Metric System..... 39
Ampere Club Organized..... 233
Brown, J. C., Becomes Superintendent of Telegraph of the Missouri Pacific System..... 576
Cleveland Session of the Telegraph and Telephone Section of the American Railway Association 451
Demonstration of Carrier Current Telegraphy and Telephony 209
Death of E. A. Cheney..... 525
Death of Louis H. Korty..... 257
Ghegan Simplex Main Line Relay 353
Hulatt, H. Is the Telegraph and Telephone Section of the American Railway Association of Value to Telegraph Department Men? 377
New Wire Crossing Law in Ohio 305
Radio for Railroad Work..... 87
Railroad Wire Systems Rank High 281
Telegraph and Telephone Section of the American Railway Association....63, 87, 329, 401, 407, 477, 185, 425, 575
Telephone Equipment Employed in Train Operation..... 526

S

Selenium a Rare Element..... 250
Southern Telegraph Reminiscence. By "N"..... 571
Semi-Automatic Sending Keys.. 83
Shop Talk. By the Observer... 541
Serial 580
Substituting Message for Telegram 161
System and Equipment for Automatically Switching Telegraph Circuits and Operating Positions 40

T

American Institute of Electrical Engineers Telegraph and Telephone Committee 483
Telegraph Facilities in 1853.... 568
Telegraph and Telephone Life Insurance Association.110, 174, 522
Telegraph Tax Ruling..... 95
Telegraphing Photographs by Code 78
Telegraph History in 1853..... 467
Telephone and Telegraph Monopoly in Foreign Countries.. 322

Telephone

Amplifier Enables Doctor to Examine Hearts by Telephone 149
First Aid for Telephone Companies 367
Heroes of the Telephone Will Get Valor Medals 43
Long Distance Telephony..... 305
Number of Telephones in the United States and Abroad.... 562
Reconstruction of Telegraph and Telephone Systems in Belgium 30
Static Discharge Effecting Telephone, Telegraph and Power Circuits at Kendalls, Wis..... 172
Task of the Telephone..... 270
Telephonic Device to Record Sound of Breath and Heart.. 556
Telephone Service in England.. 101
Telephone Battery Charging Methods With Tungar Rectifiers 540
Telephone Pioneers of America, 403, 460, 480, 518

U

United States Military Telegraph Corps 226

V

Valuable Information Instantly Available 480
View From the Top of 195 Broadway, New York 369

W

Watered Stock Impossible..... 484
What Is a Russian Rouble Worth Now? 484
Western Union Telegraph Company News Items...22, 44, 69, 91, 118, 142, 163, 191, 215, 239, 263, 285, 309, 333, 357, 381, 406, 431, 457, 482, 506, 529, 554, 580
Conference of Western Union Employees at Jacksonville..... 566
New Office at El Paso, Texas.. 536
Western Union Telegraph Company, Inc., Earnings Reports.. 70
Western Union Charges Plot... 213
Western Union Telegraph Company's Annual Report 35
Western Union Reopens Suit Against Louisville and Nashville 33
Western Union Telegraph Company's Annual Report 186
Western Union Traffic Department at Dallas Now in Its New Quarters 47
Western Union Employees' Association Agreements 69
Western Union Telegraph Company's New Chicago Building 47
Western Union Loses in Court.. 354
Western Union in New Quarters at Salt Lake City..... 382
World's Series Baseball Games. 519

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Telegraph and Telephone Age

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CONTENTS

Central Stations for Radio Communication. By E. F. W. Alexanderson 2

The Advantages of Telephone Train Dispatching. By B. F. Thompson 5

Self-Winding Clock Service 6

Wireless as a Hobby. By L. M. Dunnam 7

New Zealanders Greatest Telegraph Users. Telephone Mysteries Made Clear to High School Physicists 8

Editorial. Donald McNicol Resigns Editorship of Telegraph and Telephone Age. Morse Alphabet for Radio Telegraphy. Inductive Disturbances in Communication Circuits Originating in Neighboring Electric Power Lines 9

Radio Telegraphy. Officers and Department Heads, Radio Corporation of America. Radio News Items 11

The Railroad. Telegraph and Telephone. R. N. Young, Superintendent 15

Submarine Cable News Items 16

Students' Course in Technical Telegraphy—Lesson No. 18. Important Papers on Telegraphy 17

Canadian Telegraph Items 19

Current Events. Personal. Western Union Telegraph Company. Postal Telegraph-Cable Company 20

A Toast to a Good Man. Obituary 24

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Central Stations For Radio Communication

By Ernst F. W. Alexanderson
Chief Engineer of The Radio Corporation of America, Consulting Engineer, General Electric Company

(*Abstract of paper presented at the November 10, 1920, meeting of the Institute of Radio Engineers, New York*)

Radio achievements are often referred to as belonging in the realm of mystery, and it is indeed wonderful that we are now able to speak with a voice that carries through empty space across the oceans. Whenever knowledge conquers a new force of nature for the use of humanity, it ceases to be a mystery, but the pursuit of this knowledge makes an even greater appeal to the imagination.

The development of the steam engine was a triumph of the engineering art of the last century, but it was not the engine itself, but the steamship and the locomotive that interested humanity.

The telephone and cables no less than the steam engine have introduced a new era in human affairs. They have, to a degree, conquered space and time, but only with certain serious limitations.

An ocean cable runs only from one landing place to another and it can be cut in time of war; its use can be censored by its owners and controlled by military and naval power. When, on the other hand, you send a radio message, it may reach all parts of the world. Depending upon whether it has been sent in code or in plain language, it may be a confidential, private message or a press message intended for the world at large, but nobody can directly prevent the electromagnetic waves themselves that carry the message from reaching their destination. It is thus not exaggeration to say that the emancipation of the human spirit that was begun by the invention of the printing press has found its fulfilment in radio communication. Radio makes the transmission of ideas from man to man and from nation to nation independent not only of any frail material carrier such as a wire, but above all it renders such communication independent of brute force that might be used to isolate one part of the world from another.

These are the ideal aims which inspire the engineers engaged in the development of the radio technique. This is also the explanation why some of the foremost lawyers, executives, financiers, officials and statesmen of this country have found incentive in the human aspects of the radio technique to devote a great deal of their time and thought to its promotion and development on a world-wide scale.

The interest that is evidenced by all concerned in this subject has become much more serious since it has been established that the laws and forces with which we are dealing are within the control of our knowledge, so that engineers can now proceed with the design of a radio communication system with practically the same deliberate accuracy as in the design of an electric power transmission from a water fall to a railroad.

This audience is constituted of members of a society of electric power and light engineers as well as members of The Institute of Radio Engineers; so I shall take the opportunity to trace the close connection which now exists between electric power engineering and modern radio engineering and will demonstrate, as the specific subject of this paper, how the development of the Central Station for radio communication is as logical and inevitable as was the development of the central electric power station.

The entry of the corporation with which I have been connected for the last twenty years upon the field of radio communication has been a gradual growth and a natural consequence of its general activities in power engineering. The engineers specializing in alternating current technique were in a natural position to take up the problem of designing alternators and transformers in the radio technique. These differ from the one used in the power technique principally in the fact that the number of alternations per second is about one thousand times as great. This speeding up of the performance one thousand times involved many new problems, but the most remarkable fact to record is that *the generally established principles of the alternating current power technique could be applied to the radio technique almost without change.* It meant that the magnetic properties of iron which had been reduced to an exact science by Steinmetz thirty years ago had to be studied again at radio frequencies; but it was found the Steinmetz laws of hysteresis, eddy currents, and skin effect were as accurate at two hundred thousand cycles per second as at twenty-five cycles.

It was furthermore found that the established conceptions of phase displacement, power factor, and leading and lagging currents were as applicable and useful in the high frequency as in the lower frequency technique.

It is true that radically different methods had to be devised for measuring power factors of a fraction of one per cent. from the methods used for measuring power factor of 50 to 100 per cent., but the new methods of investigation verified the well-known principles.

The starting point of this development work was the time when Fessenden brought to the General Electric Company the problem of generating alternating currents for radio transmission. In doing so Fessenden realized that a practical solution of

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this problem could be worked out only by an organization of specialists.

Some of the problems that presented themselves in the evolution of the radio power plant were:

The design of a dynamo-electric machine or alternator generating electric power in the form of alternating currents of frequencies one thousand times as great as those used for motors and lights.

The development of magnetic amplifying devices capable of translating telephone and telegraph currents into corresponding modulations of the radio frequency energy flowing from the power plant into the radiating antenna.

The development of a regulator so sensitive as to hold the speed of an ordinary induction motor constant within a few hundredths of one per cent., this being necessary in order to maintain the proper phase relations in a load circuit working at one-third of one per cent. power factor.

Improvement of the tuning of the antenna so as to transform as large a part as possible of the generated energy into electro-magnetic waves.

The realization of Fessenden's vision, the radio power plant of to-day, became thus the result of the combined effort of leading electrical and mechanical engineers. Among these, it is sufficient to mention Mr. W. L. R. Emmet, the creator of the giant electric power stations of today.

The radio power plant which resulted from this was shown to Senator Marconi during a visit to Schenectady, and because of his interest in its performance, it was transferred to the Marconi Radio Station at New Brunswick, where it had no sooner been installed than it was taken over for war service by the Navy. Further enlargements and developments of this installation which were undertaken by the Navy resulted in the plant which is now owned and operated by the Radio Corporation of America.

Here we had arrived at a point where two schools of engineering pursuing different aims, with widely different modes of thought, had been brought before a common problem. The one had been thinking in terms of power factor, kilowatts, and phase displacement, the other in terms of wave length, decrements, and tuning.

A third school of knowledge was at that time brought into contact with this technique and added new impetus to it. As soon as such scientists as Drs. Coolidge and Langmuir began to study the Fleming valve and the remarkable little device invented by Dr. Lee De Forest and known as the audion, the foundation was laid for the vacuum tube technique which has so profoundly influenced the art of radio communication.

These scientists tell us that electricity is not the mysterious "power fluid" that we may have imagined flowing smoothly in our wires, but miniature planets or comets of condensed material electricity of definite charge and mass shooting across a miniature universe inside of a glass bulb and following orbits that can be calculated as accurately as the orbits of the stars.

Keeping in mind the origin of the modern art of radio communication in these three widely separate realms of knowledge, power engineering and electro-physics, we may now proceed to examine the essential parts. We find then—first, a modern electric power plant working at very high frequency; second, a network of wires a mile (1.6 km.) long, supported on tall masts; third, on the opposite side of the ocean a little glass bulb full of shooting stars. The question is: what does really happen?

Does the electricity generated by our alternator emanate from the antenna and flow in an undulating stream through the air or through the water or through both? If we search for it in an airplane, we find it, and if we submerge ourselves in a submarine and search for it, we find it, and yet we are told it is not so.

Does the little electron, as an individual, take a leap off the aerial wires and, after devious paths, find its home in the glass bulb on the other side of the ocean? We are also told that it does not.

If I knew exactly what really does happen, and should try to tell you, then sooner or later somebody would claim that I was altogether mistaken. Therefore, I will only try to tell you how I imagine that it happens, wondering if any of you will see the same mental picture of the process that I see.

We were once told by the physicists that all space was filled by a fine substance that was called ether, and that the light and heat that radiated from the sun was a wave motion in the ether. The physicists now tell us that there is no ether, but still they say that light is a wave motion. Be this as it may, for the purpose of visualizing what takes place in radio transmission, it is convenient to cling to the theory of the ether.

We are familiar with other forms of wave motion—the air waves that carry sound to our ears and the water waves on the ocean. Thus the carrier of the radiated electric energy must not be likened to the flowing stream of water, or to the wind or to a bullet shot from a gun, but likened to a wave in a uniform medium where each particle of the medium oscillates around a stationary base line while the wave rolls forward.

The distance that a wave can travel in an absorbing medium before it fades out to a definite extent is proportional to its length. We may therefore introduce the idea of wave length, which is the distance from the crest of one wave to the next. The long swells of ocean travel for hundreds of miles, whereas a pebble dropped on a still surface of water produces a ripple that fades away in a short distance.

In radio communication it has been observed that the distance over which reliable communication can be maintained is about 500 times the length of the ether wave that is uesd. It may be more than a mere coincidence that the distance to which a sound wave travels in air, and a wave on the surface of water will travel before it fades out, is also about 500 wave lengths. The average wave length of sound of spoken words is about one foot (0.3 m.), and we know that if we speak loudly our

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voices will carry a distance of about 500 feet (150 m.). The exceptions to this rule that will occur to anybody are also significant. We know what distances voices will carry over a lake in a quiet evening. We also know what extraordinary distances radio signals will carry sometimes in a quiet night. These are "exceptions that prove the rule," and the rule refers only to reliable communication under normal conditions.

A radio transmitting system is designed for the purpose of producing waves in the ether which we call electromagnetic waves, and for controlling the rate at which the waves are produced in such a way that a train of successive waves will carry the meaning of articulate speech or telegraphic code. If we wish to send a message a long distance, we must select a long wave. The distance to Europe is 5,000 kilometers (3,200 miles). If this distance is to be bridged by 500 wave lengths, each wave length must be at least 10 kilometers (six miles), or, as it is usually expressed, a wave length of 10,000 meters.

We can produce wave lengths by rocking a boat. If we rock a canoe rapidly we get a short wave, but if we rock a larger boat more slowly we get a correspondingly longer wave. To rock the boat requires energy, but in order to produce a wave of suitable length, the energy must act through an intermediate member which has suitable size, proportions and period of oscillation.

In radio transmission the energy is furnished by the radio frequency power plant, but, in order to transform this energy into waves, there is required the intermediate member which makes contact with a large volume of the medium which carries the wave motion. This medium is the ether and corresponds to the water or the air in the more familiar forms of wave motion. The member that transforms the energy to the ether is the antenna. The waves used for trans-atlantic communication are as a matter of fact 10,000 meters long, or even longer. The antenna corresponds to the hull of the rocking boat or the sounding board of the piano.

The analogy with water waves may be carried still further. The wave is a successive displacement of the medium, and the initial displacement produced by the member acting upon the medium is proportional to its volume. The water displacement of the boat corresponds to the effective volume of the antenna. The maximum voltage at which the antenna can be operated corresponds to the maximum angle to which the boat may be rocked before it ships water. This is the voltage at which the surrounding air breaks down under the electrostatic pressure. In electrical units, the displacement in the ether is expressed in meter-amperes. This is really a measure of volume as is apparent from the consideration that the amperes charging current at the limiting voltage is proportional to the two horizontal dimensions. The third dimension or the height appears directly in the product, and is expressed in meters.

The height of the antenna is the most expensive of the three dimensions by which we may create electric displacement in the ether. The tendency in stations designed for greatest economy is, therefore, towards structures of moderate height and great length, whereas, the tendency in the past, when dynamic efficiency was the principal consideration was towards towers of great height. The unit of performance on the old basis was kilowatts consumed by the antenna. The unit on the new basis is "ether displacement." This modern measure of antenna radiating capacity is the number of meter-amperes of "ether displacement" that can be produced at the voltage which is limited by the breakdown of the air.

The antennas of the stations of New Brunswick, N. J., and Marion, Mass., which are now used in trans-atlantic service, are each one mile (1.6 km.) long. In the new Radio Central Station, which is being built by the Radio Corporation on Long Island, there will be ten or twelve antennas, each a mile and quarter (2 km.) long. This station is intended to communicate efficiently with all parts of the world. When very long distances are to be spanned, correspondingly long waves will be used. For efficient transmission of these long powerful waves, an antenna will be needed that makes contact with a large volume of ether. This will be accomplished by combining several of these antennas into one unit. At other times the same attennas will be used for the simultaneous transmission of several messages over shorter distances.

The shifting of radiation power which had been referred to is made possible by the use of the multiple tuned antenna which has been described in a previous paper before The Institute of Radio Engineers. The New Brunswick and Marion antennas are now tuned so that each acts as six single antennas operating in multiple. The combining of several such groups in multiple is only a further extension of the same principle.

When two such antenna groups are connected in multiple, the resistance loss is reduced to one-half. Hence the efficiency of the antenna is increased so that a given power produces more radiation. Still more important is, however, the fact that more power may be utilized at this increased efficiency, and so the net result is that the amplitude of the radiated wave is doubled, which means that four times as much energy is radiated.

The economical factors that point to the radio central station as the practical solution of the problem of long distance communication are practically the same as those that created the central electric power station. Broadly speaking, they provide for the utilization of the plant investment and operating force to the utmost by shifting the equipment from one service to another and combining it to meet various demands.

New York is a natural communication center and the service must extend to Europe, South America, and westward. Another Radio Central Station at Hawaii is being equipped to serve as a relay for all points on the other side of the Pacific Ocean.

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While it is winter on the northern hemisphere, the radiating power to Europe can be much reduced, but this is the season when the South American traffic requires a maximum radiation because of summer conditions then existing on the Southern hemisphere. The New York Radio Central Station can then divert some of its radiating power from the European to the South American circuits. There will also be daily fluctuations in traffic load which will occur at different hours due to the difference in geographic longitude. Thus the peak load of European traffic will occur at different times than the South American and Western traffic. The central station equipment can be utilized so as to take advantage of this.

The realization of trans-atlantic radio telephony for commercial purposes is another object of the Radio Central installation. Trans-atlantic telephony will, no doubt, be something of a luxury for the immediate future. The radiation intensity needed for telephony is much greater than for telegraphy, and a plant designed purely for telephony might prove very expensive. However, the flexibility of the Radio Central, where any number of antennas can be combined when desired to produce a more efficient radiation, will make an extra powerful transmitter available when needed, while the plant may be used in a more economical way at other times for telegraphy.

The Advantages of Telephone Train Dispatching and Telephone Message Circuits on Railroads.

By B. F. Thompson
Telephone Engineer, Telegraph Department,
Baltimore and Ohio Railroad

By the use of telephone dispatching circuits a dispatcher can handle one-third longer section with greater ease than by Morse circuit; therefore, if the same section is equipped he is handling only a two-thirds load.

He is able to talk direct with engineer or conductor, while with the Morse he has to transmit to the operator, who telephones it to the end of siding, gets the conductor's or engineer's answer and retransmits it by Morse to the dispatcher.

With the telephone, the operator connects siding line direct on the dispatching circuit and the engineer or conductor talks from end of siding direct with the dispatcher.

Another advantage is that the dispatcher rings each office direct and gets an answer back showing that the bell is ringing at way station; while with the Morse he has to call until the operator answers in Morse characters. With the telephone he is also able to talk with the first operator and at the same time ring the second operator in.

The telephone train dispatching circuit also saves overtime in the movement of trains, causing faster handling of traffic and increase in tonnage moved within a certain period, thus increasing the average car mileage.

We can work an additional Morse circuit over the telephone train dispatching circuit without interfering with the dispatching circuit. This Morse simplex wire can be used as a part of a Morse through circuit; for example, we can use a single Morse wire Baltimore to Washington Junction, simplex over telephone circuit Washington Junction to Cumberland, and a single Morse wire from Cumberland to Pittsburgh, thus saving the building of an additional wire for Morse service between Washington Junction and Cumberland, 100 miles, at a cost of $5,200.

The connection of a simplex circuit is simple. We use simplex coils at both terminals of the dispatching circuit, connecting resistances in series with both sides of the coil, the coil and resistances being in multiple with the line. The resistance inserted depends upon the amount of resistance of bridge at the point where coils are placed and the potential at that point. The amount of current flowing through coil is generally 44 milli-amperes at distant end and 36 milli-amperes at dispatcher's end. The telegraph wire is connected at neutral point of coil and the current is divided equally over both telephone wires to the distant end.

The dispatcher has an automatic key cabinet containing a key for each station on the line. This key cabinet controls a local relay which operates through a local battery, the main line points of which connect the main line battery through retardation coils which smooth out the kick of battery, thence to line. The code of impulses sent out by the automatic key passes through the coils of each selector, which are bridged across the line. The only one which closes its local contacts is the one of the same combination transmitted, each key being of a different combination.

All the relay points are bridged by condensers and resistances to prevent burning of the points. The telephones are in multiple with the line through condensers which do not permit the direct current of main battery to pass through telephone when a call is made. Each selector has inserted in series with it a resistance to permit ten milli-amperes of current to pass through selector coils. The time is not far off when we will be able to get an additional telephone circuit over the dispatching circuit which can be used as a trunk between two private branch exchanges, by the use of wired wireless telephones.

We have telephone train dispatching circuits extending between Washington Junction, Md., and

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St. Louis, Mo., a distance of 845 miles, with branches leading therefrom as follows:

Clarksburg to Hartzel and from Clarksburg to Fairmount, operated from Grafton, 65.8 miles; Hamden to Portsmouth, operated from Chillicothe, 85.6 miles; Midland City to Columbus, operated from Chillicothe, 124 miles; Cincinnati Terminal, Cincinnati to Toledo, 202.9 miles; North Vernon to Louisville, operated from Seymour, 72.7 miles; Flora to Beardstown and Flora to Shawneetown, 228.5 miles. In addition, we have the same class of circuits: Tottenville to Clifton, 12.6 miles; South Beach to Cranford, 16.2 miles; Baltimore Terminal, 17.6 miles; Connellsville to Johnstown, 78.5 miles; Connellsville to Fairmont, 69 miles; Pittsburgh to Wheeling, 68 miles; Wheeling to Grafton, 99.8 miles; Wheeling to Holloway, 40 miles; Newark to Wheeling, 108 miles; Dayton to Wellston, 115.6 miles; Jenkins to Shelby, 31 miles; total, 2263.2 miles.

All of these telephone train dispatching circuits are paralleled with telephone message circuits which are used normally as side wire and to make the telephone train circuits good when they fail, with the following exceptions: West End Cumberland Division, Ohio Division, Toledo Division and Illinois Division. On these divisions, when the telephone circuit fails, we use Morse telegraph circuits in lieu thereof until telephone circuits are restored. —*Baltimore and Ohio Magazine.*

Self-Winding Clock Service

Brooklyn is a timekeeper to the world. From the Temple of the Grand Lama of Tibet to the big clock on the tower of the Metropolitan Building over in Manhattan, Brooklyn clocks tick off the minutes and strike the hours for a hustling or idling universe.

The Western Union has a great system of timepieces, regulated hourly. A big Brooklyn corporation makes the clocks.

The Self-Winding Clock Company, 161 Grand Avenue, makes this time, time that winds itself up.

Briefly, this is how it does it:

It installs clocks where they are wanted. Each clock is equipped with a small electric motor which winds up the spring. The motor is kept active by little batteries. These motors wind the spring up every hour. And this keeps on for over a year, when the batteries are renewed and the same thing goes on all over again. Like time, these clocks with a little attention run on forever.

Now, the Western Union prides itself on furnishing the correct time. In the days before the telephone girls began to wear georgette to breakfast and even used the winning "voice with a smile," and said they were real sorry for giving the wrong number, the telephone company used to furnish the time over the phone. But now the Western Union is the sole ally of the old man with the scythe.

It takes clocks from the Self-Winding Clock Company, hooks them up on a circuit anywhere from 5 to 100 at a time, and regulates them hourly over its great system furnished by the United States Observatory at Washington, D. C.

The Self-Winding Clock Company has furnished to Greater New York about 15,000 of these clocks, who base their averages on figures given out hundreds of miles away. The motto of the company and the Western Union is that anywhere a telegraph office is working there can a clock be linked up. Clocks in San Francisco can be made to tick off seconds exactly as fast or as slow as clocks in Brooklyn, which is a twentieth century achievement of the first magnitude.

Few people ever stop to think about clocks. -They glance at them and then hasten their steps to catch the 6.12 for Massapequa out at Atlantic Avenue, or something like that.

Big Metro Clock Made Here

The big clock, for instance, on the Metropolitan Tower, has only one rival in the world—Big Ben of London. It probably is seen daliy by more people than any other clock on this globe.

Its minute hand weighs half a ton. Its hour hand weighs 700 pounds. The figures on the dial are 4½ feet high and the dial has a diameter of 28½ feet. The minute hand is 17 feet long. It was made by the Self-Winding Clock Co. of Brooklyn.

Harried fans, dashing madly into the Pennsylvania or Grand Central Terminal, Cleveland-bound, glanced hopefully at any number of big and little clocks hanging about the big railroad stations. They were made by the Self-Winding Clock Company of Brooklyn.

The company specializes on railroad electric clocks. The little timepieces over the ticket booths and elsewhere in the Brooklyn Rapid Transit and Interborough subway systems are products from its master clockmakers. The famous London "Underground" came to Brooklyn for its clocks. The company furnishes electric time to points all over the world. It numbers its clocks in the United States by tens of thousands.

Clocks in big office buildings like the Equitable Building, 120 Broadway, come from its benches.

It is a modest corporation, this Self-Winding Clock Company. It makes no extravagant claims. It just goes out and posts its clocks, and they do all its talking. It is a language that all understand, all heed, and few comprehend. Hence this article. Railroad time is made in Brooklyn.—*The Telegram.*

Phillips' Code; thoroughly revised and brought up to date, with supplement to February, 1920; a popular and generally used and thoroughly tested method of short-hand arranged for telegraphic purposes and contemplating the rapid transmission of press reports; also for general newspaper and court reporting. Flexible cover, vest pocket size, $1.25. Address and make remittances to Telegraph and Telephone Age, 253 Broadway, New York.

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WIRELESS AS A HOBBY

Washington Operator Finds It More Thrilling Than Golfing or Motorcycling, both of Which He Discards for a Spark Set

By L. M. DUNNAM
Operator, Associated Press, Washington, D. C.

Amateur radio is too generally looked upon by the uninitiated as "a boy's game." It is indeed fine for the boys, with their little loose-couplers and crystal detectors—a clean pastime that grips their interest—but is also an excellent hobby for the old boys. There are, however, thousands of really big amateurs, including men who have grand-children, men who are not content with the neighborhood communication that answers for the youngsters, their aim being a receiving outfit that gathers in everything. One must be satisfied, however, with a transmitting power of one kilowatt, the limit allowed by the government but the receiving range depends entirely on the amateur's efficiency, in which there is keen competition.

Many improvements in wireless have been accomplished through the experiments of amateurs. It is a fact that some of the discoveries made actually have been stumbled upon by amateurs while making various experiments, just to see what would happen! Even the scientific experimenters have much to learn about the actual functions performed by some parts of radio apparatus. Nor are men and boys monopolizing this interesting scientific field. Many women and girls have entered it, and some are using apparatus which has been constructed entirely by themselves. One of the most efficient long-range amateur stations in the country is operated by a man and his wife in Ohio.

A PLEASANT AND INSTRUCTIVE AVOCATION

The object of this article is to interest the reader in what I consider a pleasant and instructive avocation. I am a firm believer in every person having a hobby of some sort. I was a devotee of golf and motorcycling, both of which are great sport, but when a friend interested me in radio last winter I threw them into the discard. My first set was constructed entirely by myself with the exception of the telephones. I used a loose-coupler and crystal detector and obtained fairly good results.

As Frenchy would say, "It is to laugh," when I hark back to my first efforts to dig some sound out of the air with my home-made apparatus. I recall the night when, by straining my hearing to its utmost, heard "NAH" (New York) sign up for the first time. I could have shouted for joy! With my present outfit I can lay the phones on the table and read the same station all over the room, the signals being almost painful with the phones to my ears.

Wireless as an avocation should especially appeal to telegraphers. There are few of us but have some knowledge of electricity, which is a valuable asset, and Continental Morse may easily be learned.

The radiophone (it is generally conceded that it will supplant the "sparks" in the future) offers attraction for those who are not telegraphers. For instance, while airplane squadrons from Bolling Field, this city, equipped with radiophone apparatus, are flying over the city, I sit in my room and listen to the flight-commander give his commands, hearing him as clearly as if I sat beside him, and then watch the squadron, through my back door, execute the maneuvers. On other occasions planes make flights miles away from the city, keeping in constant touch with the field by phone, giving their positions and altitude as they proceed.

We are often treated to musical concerts—singing, piano, phonograph, etc.—by the several amateur radiophones in the city and by the Radio Research Department of the Bureau of Standards. Incidentally, the Bureau of Standards commandeered my services for about two hours one night, in making tests between two of their high-powered radiophone sets, trying various adjustments and different parts of apparatus, while I reported the results of the tests to them with my spark set.

LISTENING TO FAR AWAY MUSIC WHILE WORLD IS ASLEEP

On another occasion I listened for two or three hours to the steamer Ontario, just off the coast of Massachusetts, keeping in constant communication with the Western Electric Company's experimental station at Deal Beach, N. J., both using radiophones, and I heard them both as clearly as one is heard on the ordinary city telephone.

When the conversation flagged Deal Beach would start phonographic music. Can you imagine the fascination of sitting in your own room during the wee small hours, with most of the world asleep, listening to music from the air inspired over two hundred miles away? It was loud and distinct enough to be heard to some extent all over the room.

Now, for a brief description of my present equipment. I use the well-know Armstrong regenerative "hook-up"; De Forest "honeycomb" inductances; series-parallel primary, secondary and "tickler" condensers; Audiotron detector tube, and VT-I's in my two-step amplifier. One of my amplifying transformers is a Federal, the other one I constructed myself from parts of a Ford spark-coil, which gives 90 per cent. the results of the Federal. My phones are 3,200 ohms resistance. The antenna is 80 feet in height, two-wires 60 feet long, with a lead-in of about 150 feet.

My receiving range covers all wave lengths, from 175 to 20,000 metres, and my distance range to date is the government station at Pearl Harbor, approximately 6,000 miles, which I read with ease every night when they are working with Cavite, P. I., and Guam. Amateurs from Michigan, Missouri, Massachusetts and Georgia "pound-in" fine, and I also "get" ships and shore stations from Canada to Cuba innumerable. In fact, I can read Canadian and Florida stations, especially Miami, ten feet from the phones. All the high-powered trans-Atlantic stations are read with ease, and I have heard Nauen, Germany, three feet from phones.

Up to the present I have not gone in very strongly for transmitting, wishing to perfect my receiving

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outfit first, and am now using a quarter-kilowatt transformer, rotary gap and condenser, and an oscillation transformer of my own construction. I have had no opportunity to give this outfit a tryout for distance. With the same equipment, a record of 800 miles is claimed, but this is unusual, although a couple of hundred miles should be covered consistently.

Unfortunately I am located within the five-mile range of a government station (Arlington) and am limited to one-half kilowatt power, but I hope, in the near future, to move out of this range and install a one-kilowatt transmitter that will reach as far as the best of them.—*Associated Press Bulletin.*

NEW ZEALANDERS, GREATEST TELEGRAPH USERS IN THE WORLD

E. A. Shrimpton, Dominion's Chief Engineer, Here to Investigate Our Latest Developments

New Zealand is giving the rest of the world a good race in the perfection of its telephone and telegraph systems, according to the statements of Mr. E. A. Shrimpton, M.I.E.E., permanent chief engineer of the Telegraph and Telephone Department of the island dominion, in an interview at the general offices of the Western Electric Company, New York, recently. At the present time there are 85,000 telephones in use in New Zealand, an average of one to every sixteen inhabitants. Subscription to the phone system has never been solicited, a fact which makes the figures more to be wondered at.

The little island outpost of the British Empire takes particular pride in the fact that it has developed its lines of communication to such an extent while the British Isles can only boast of one telephone to about every forty-seven persons. Telephone rates in New Zealand have been increased this year without in any way decreasing the demands of new subscribers.

Mr. Shrimpton gave a very interesting history of the development of the lines of communication in New Zealand. "Our first telephone exchange was erected at Christ Church in 1880," he stated, "yet today we have 400 exchanges in a country of only 1,100,000 people. There is not a place in New Zealand where the pedestrian cannot find a telephone line. We have even installed a line to 'The Hermitage,' at the peak of our loftiest mountain, much to the regret of the tired business men, who had been accustomed to flee there to escape the hum-drum of office life."

The twenty-five subscribers to the original system in 1880 were not attracted by the low cost of their new convenience. The rate at that time was £25 a year.

New Zealand has sent Mr. Shrimpton to the United States to investigate the latest developments in telephone and telegraph apparatus. In 1911 the new automatic exchange system was introduced into his department. Since the war twenty-three Western Electric rotary automatic exchanges have been or will be put into use in New Zealand.

"We New Zealanders are the greatest telegraph users in the world," Mr. Shrimpton remarked. "During 1919 our telegraph lines carried over 14,000,000 messages, a far higher average than I believe prevailed in the United States. We never think of sending Christmas post cards—all our good wishes and short business communications are sent by wire."

At the present time New Zealand has supervision over all the British wireless stations in the Pacific. In addition to five in its own territory, Mr. Shrimpton's department controls the stations at Chatham Island, Apia and Raratonga. Before the war the station at Apia belonged to Germany. It is over 1,800 miles away from headquarters at New Zealand.

"I am surprised to find how many Americans believe New Zealand and Australia are next door neighbors," Mr. Shrimpton said. "We are at least 1,250 miles away from our sister dominion. Although no white man touched our shores until Captain Cook appeared in 1769, only seven years before your Declaration of Independence, over 75 per cent. of our citizens are native born. Of these 50,000 are Maoris, the original inhabitants of our island. They are one of the greatest races on the earth."

Maoris occupy some of the most important positions in New Zealand, Mr. Shrimpton stated. The compulsory education which has existed for forty-five years has been eagerly seized upon by the old natives, who number in their ranks several of the most eloquent orators in the Dominion parliament.

Telephone Mysteries Made Clear to High School Physicists

Telephone subscribers of the next decade should have a far better knowledge of the actual workings of the telephone system than their seniors of today. The Physics Club of New York, an organization which includes practically all of the instructors of physical sciences in the Metropolitan scholastic zone, celebrated its annual election and business meeting in November by making an inspection of the laboratories of the Western Electric Company, New York. The most modern transmission developments were explained to the educators, a fact which is sure to be reflected in a more comprehensive understanding of telephony among their many thousand students.

The new machine switching devices which are now being introduced and will automatically make connections between subscribers was of particular interest to the instructors. They also spent a considerable period watching the operation of the repeaters which have made possible the transcontinental telephone.

The development of the telephone was demonstrated by taking the visitors through the museum where are on exhibition the actual first inventions and their various stages of improvement up to date. The generation of electric current by means of rochelle salts and the application of this phenomenon in the use of its crystals both as telephone receivers and transmitters were studied by the teachers.

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EDITORIAL COMMENT

Donald McNicol Resigns Editorship of Telegraph and Telephone Age

Donald McNicol, who has been editor of TELEGRAPH AND TELEPHONE AGE for over two years, severs his business relations with this publication on January 1st, 1921, to engage in a wider field of usefulness, which his qualifications eminently fit him to assume.

We are sure that we express the sentiments of his numerous friends in the telegraph, telephone and railroad fields when we extend to Mr. McNicol our heartiest good will and our best wishes for his future success, which we know awaits him in whatever line of endeavor he may choose to follow.

During Mr. McNicol's connection with this journal he has made many warm friends for the paper and for himself among those identified with the electrical industry, and has rendered valuable service in bringing the publication up to its present high standard.

Morse Alphabet for Radio Telegraphy

It is but a matter of time when the railroads of the country will be making daily use of radio telegraphy. Already several roads are installing, or planning the installation, of radio towers and operating apparatus in order to insure communication service between important terminals in case of interruption to wire service, and also to carry traffic at times when the message load exceeds the capacity of present wire lines.

It is rumored that the four large radio stations owned by the Lackawanna Railroad, installed at Hoboken, N. J., Scranton, Pa., Binghamton and Buffalo, N. Y., are to be operated regularly by the Radio Corporation of America and that the service is to be available to the railroad company when required for operating purposes.

Committee No. 12, Radio and Wired Wireless, Telegraph and Telephone Section, American Railway Association, has in hand the work of conducting an investigation looking to the utilization by American railroads of all possible advantages of these new developments. A considerable amount of valuable data already has been gathered, and certain practical tests are planned.

An important question discussed by the members of the committee at a recent meeting is that of the use of the Morse alphabet in place of the Continental alphabet in radio work at railroad and commercial land stations in the United States. Recommendations are likely to be made that the present radio laws be so modified that American land line operators, all of whom use the Morse code, may be employed in land radio operation.

There is little likelihood that the Continental will ever supplant the Morse alphabet in commercial or railroad wire telegraphy in the United States or Canada and there is no justification requiring an operator to use two alphabets. The sensible thing, therefore, is to permit the use of the Morse code at all stations not in regular or service communication with radio stations in other countries—international stations.

The requirement that operators must be able to read a stated number of words per minute in the Continental code in order that they may understand Government stations and coastal stations when orders are transmitted in regard to interference can easily be met by adopting an interference signal common to both alphabets.

The extension of radio in overland working will be facilitated if operators are allowed to use the alphabet they already know.

Inductive Disturbances in Communication Circuits Originating in Neighboring Electric Power Lines

As an engineering problem inductive interference remains about as far from solution as before the Joint Committee on Inductive Interference, California Railroad Commission, commenced its investigations six years ago. The committee's report contained a large amount of valuable data and many constructive suggestions, but as to corrective measures practically all we have had as a result of the work done has been a series of other investigations by various other committees and commissions.

The problem is viewed as one which can be solved only by co-operative effort on the part of the communication companies and the electric power companies. The engineers of the American Telephone and Telegraph Company have conducted a continuous study of the subject over a period of many years and have reached conclusions as to what is necessary to free communication lines from interfering currents from other systems. It would be of particular value at the present time if these conclusions and deductions could be made public—at least, public to the extent of being embodied in a technical paper for circulation among engineers in the service of other companies engaged in communication service, and among engineers engaged in electric power work.

During the past year or two the National Electric Light Association has taken up the subject from the viewpoint of the interests of power distributing companies, and from time to time announcements have been made from that source that substantial progress is being made. To date, however, no details of the work under way have been made public.

It is stated that the idea of the power engineers is that heretofore study has been mainly devoted to the disturbing features of inductive fields produced by power circuits and to the means for their reduc-

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tion, rather than being directed toward minimizing the susceptibility of communication systems to the inductive fields of power circuits, and means for minimizing this susceptibility.

The ground on which this stand is taken is not particularly substantial. It is not sensible to think that the telephone and telegraph companies have overlooked any known principle of theory or practice which would, if applied, render their lines less subject to disturbances from extraneous sources.

It may be that the communication companies have done all that is possible on their part to avoid the effects of these disturbances, and it may be that there is nothing further the power companies can contribute toward a solution, but there is no sound reason why what has been learned should not be distributed widely among engineers. Problems of this kind are solved more quickly when many minds are at work on them.

A Proposed Telegraph Convention

A proposed telegraph convention between the great powers drawn up by the International Communications Conference at Washington, D. C., on December 6, is understood to meet with vigorous opposition from the American commercial telegraph companies, who are said to profess to see in it the virtual extension of the wartime powers exercised by the United States over the telegraph and a step toward eventual governmental control.

The American commissioners to the conference have approved the proposed convention with reservations, the exact nature of which has not been disclosed. The convention is included in a general one governing the international use of cable, radio and telegraph, and the whole must be approved by a general communications conference to be held later, and then by the various governments before it can become effective. In the case of the United States, ratification by Congress will be necessary.

The United States hitherto has refrained consistently from entering any of the telegraph conventions, on the ground that the conditions governing the telegraph in most states where this means of communication is government owned made participation of the United States inadvisable.

Particular clauses of the proposed convention to which the American commercial telegraph companies are said to take special exception and against which they are reported to plan an attack should the convention be presented to Congress, include provisions which give the various governments virtually the right of censorship in peace times. These articles include four, seven and eight, which read as follows:

"Each government undertakes to devote to the international telegraph service special wires, sufficiently numerous to insure the rapid transmission of telegrams. These wires shall be established and worked in the most efficient manner indicated by experience of the service.

"The high contracting parties reserve to themselves the right of stopping the transmission of any private telegram which may appear dangerous to the security of the state or which may be contrary to the laws of the country, to public order or decency.

"Each government reserves to itself the right of suspending the international telegraph service for an indefinite period upon condition that it immediately advised each of the other contracting governments."

Increase in Cost of Telegraph Materials

In testimony recently presented in Arizona relating to the necessity for an increase in telegraph rates, it was brought out by R. J. Meigs, valuation engineer of the Western Union Telegraph Company that price comparisons between the years 1910 and 1914, normal price years, and 1919, show vast increases in the cost of practically everything used in connection with telegraph plant.

Among other items there is an increase of 224 per cent. in the cost of poles; 182 per cent. increase in the cost of cross-arms, 211 per cent. increase in the cost of guy rods, and 89.7 per cent. increase in the cost of iron wire.

An Improvised Primary Battery

R. G. Dundas, assistant telegraph instructor, Western Collegiate Institute, Vancouver, B. C., Canada, reports using an improvised primary battery which was worked out by Mr. Jobson of the Canadian Pacific Railway Company's Telegraphs, Vancouver, and which has been found to give good service at low cost.

The idea is to make use of six worn-out dry cells, removing outer cardboard casing and binding the cells together by wrapping several turns of bare copper wire around them. A supply wire is then attached to the three carbon terminals of the cells (in the center of the cells) while the other supply wire is attached solidly to the binding wire which holds the cells together.

The zinc casings of the cells are punctured in eight or ten places with a punch or nail and the group placed in a single gravity cell jar, or other glass or earthenware container. The jar is then filled with water up to a point a half inch below the tops of the dry cells. The water should be made into a solution consisting of one quart of water to four ounces of common salt.

It is stated that two groups of cells, each in a separate jar, and connected in parallel will operate a four-ohm sounder over a period of three months, the only attention required being that of occasionally replenishing the water as it evaporates.

This seems to be a real use for discarded dry-cells.

THE DAILY NEWSPAPERS do not now seem to have space for propaganda looking to Government ownership of the telegraphs. The Postmaster General relegated the subject into the remote future.

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Radio Telegraphy

Radio Corporation of America

The following is a list of operating officials of the Radio Corporation of America:

Commercial Department

David Sarnoff, commercial manager; G. Harold Porter, assistant commercial manager; E. E. Bucher, commercial engineer; George W. Hayes, traveling representative; John B. Duffy, superintendent Eastern Division, 326 Broadway, New York; Arthur A. Isbell, general superintendent, Pacific Division, Insurance Exchange Building, San Francisco; Lawrence A. Malarin, marine superintendent, San Francisco; George W. Nicholls, district superintendent, 136 Federal St., Boston; James M. Sawyer, superintendent, Maintenance, Repair and Inspection, 326 Broadway, New York; Lee L. Manley, assistant superintendent; Thomas M. Stevens, superintendent Southern Division, Gay and Pratt Sts., Baltimore; Julius A. Pohl, superintendent Gulf Division, 331 Canal-Commercial Building, New Orleans; Edwin A. Nicholas, superintendent Great Lakes Division, Schofield Building, Cleveland.

Traffic Department

W. A. Winterbottom, traffic manager; John B. Rostron, assistant traffic manager; H. Chadwick, superintendent, 68 Broad St., New York; C. J. Weaver, assistant superintendent, 68 Broad St., New York; W. H. Barsby, superintendent, Belmar, N. J.; W. E. Wood, superintendent, Chatham, Mass.; G. E. Baxter, superintendent, 300 California St., San Francisco; F. M. Roy, superintendent, Marshall, Cal.; H. A. Oxenham, superintendent, Koko Head, T. H.; W. P. S. Hawk, superintendent, Honolulu.

Engineering Department

E. F. W. Alexanderson, chief engineer; C. H. Taylor, assistant chief engineer.

Plant Department

Alexander E. Reoch, plant engineer.

Divisions

W. A. Graham, Transmitting Stations; W. G. Lush, New Construction; C. W. Latimer, Receiving Stations; R. T. Rossi, Construction Inspector.

Engineers-in-Charge Transmitting Stations

T. J. Hayden, New Brunswick; B. S. Y. Clifton, Marion; G. L. Usselman, Tuckerton; W. H. Graff, Bolinas; S. W. Dean, Kahuku (acting).

Comptroller's Department

C. J. Ross, Secretary and Comptroller; H. A. Sullivan, auditor of disbursements; William Cockett, auditor of receipts.

District Managers

W. P. Kelland, Gay and Pratt Sts., Baltimore, Md.; Edwin M. Hartley, 109 South Second St., Philadelphia, Pa.; L. H. Gilpin, 220 Brewer St., Norfolk, Va.; Watson Sidney, 204 Broughton St., West Savannah, Ga.; P. R. Ellsworth, 410 24th St., Galveston, Tex.; Alfred Thomas, Jr., Chief Operator, 510 Bonheur Building, Chicago, Ill.; W. F. McAuliffe, Maritime Building, Seattle, Wash.; R. S. Palmer, 270½ Third St., Portland, Ore.; H. L. Bleakney, Southern Pacific Building, San Pedro, Cal.; G. B. Williamson, Port Arthur, Tex.; J. E. Broussard, P. & O. Steamship Co., Key West, Fla.; R. H. Coffin, Representative, Battle House, Mobile, Ala.

H. J. Smith has been appointed assistant engineer in charge at the Tuckerton, N. J., station.

A. B. Tyrell, receiving engineer, has been transferred from the Chatham, Mass., station to the Belmar, N. J., station.

On December 24 business was suspended at the head office at noon and the employees, together with delegations from trans-oceanic and other departments, Wireless Press and nearby high power stations to the number of 250 participated in a buffet luncheon, tendered by the corporation. This was followed by dancing and a general good time, an excellent orchestra being provided. It was a joyous gathering and everyone went home happy and laden with good wishes.

Alexander Nicol has been appointed auditor of receipts, vice William Cockett, transferred to 933 Broadway branch, as manager.

Employees at the head office and auxiliary offices, including high power stations, contributed to a fund for filling large red Christmas stockings with toys, candies, fruits and useful articles for children. Seventy of these filled stockings were for the poor children of New York City and were sent to the Society for Improving the Condition of the Poor. Twenty-five were sent to eight families of tenants on the company's property at Radio Central Station, Long Island. Stockings were also sent to convalescent children in Bellevue Hospital, New York, as well as to several individual families, whose names were sent in by interested persons. For the babies, useful articles were included, such as warm dresses and jackets, underwear, caps, mittens, stockings. A number of the staff at head

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office gave much of their time in making the articles of clothing, dressing the dolls, filling the stockings and making up packages. Reports received indicate that the stockings were received with great joy.

LEE LEMON has been appointed director of traffic production, with headquarters at 64 Broad Street, New York.

AN ORGANIZATION has been formed at the head office to receive contributions for relief of families of the telegraph staff in Vienna.

MISS T. N. BROWN, secretary to the president, sailed for Bermuda recently on the S. S. *Fort Hamilton* for the holidays.

J. C. DAVIDSON and WALTER W. MONK, radio engineers, are now located at the Deal Beach, N. J., radio telephone laboratory of the Western Electric Company.

G. H. PEARSON, traffic manager of the Marconi Wireless Telegraph Company of Canada, was a New York business visitor on November 27.

MAJOR J. O. MAUBORGNE, Signal Corps, Washington, D. C., at a recent meeting of the Franklin Institute, Philadelphia, Pa., presented a paper on the subject, "Resonance Wave Coils for Radio Transmission and Reception." Lantern slides were used in illustration and practical demonstrations were given by Major L. M. Evans and Captain Guy Hill.

L. W. CHUBB, engineer of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., manager of the radio engineering department of the company, has been engaged in both theoretical and practical work with the Westinghouse company for 15 years, having joined the company as a student engineer after graduating from the electrical engineering course of the Ohio State University in 1905. During the past year Mr. Chubb has been on special duties in the material and process engineering department, and before that for over ten years he was in charge of the electrical section of the research division, engineering department. For many years Mr. Chubb has been an active member of committees of the American Institute of Electrical Engineers, and at the present time he is a member of the meetings and papers committee, standards committee and electro-physics committee of that organization.

A REUNION DINNER of ex-students in the War Radio Course at Sorbonne University was held at Henrico's Restaurant, 66 West 11th St., New York, on the evening of December 1. At the conclusion of the dinner all members and guests attended the regular December meeting of the Institute of Radio Engineers scheduled for the same evening in the Engineering Societies building.

CHARLES V. LOGWOOD, for many years in the service of the De Forest Radio Telephone and Telegraph Company, New York, as engineer, and who has been on the Pacific Coast during the past few months, is shortly to return to New York to continue research work with the De Forest Company.

Institute of Radio Engineers Nominations for Officers, 1921

The membership of the Institute of Radio Engineers has nominated the following engineers as officers and managers. The election is now under way by mail ballot:

For president: E. F. W. Alexanderson, Leonard F. Fuller.

For vice-president: Fulton Cutting, Lloyd Espenschied.

For secretary: Alfred N. Goldsmith.

For treasurer: Warren F. Hubley.

For managers, serving until 1924—two to be elected: E. H. Colpitts, J. V. L. Hogan, L. F. Krumm and Donald McNicol.

Radio Club of America

At the December 23rd meeting of the Radio Club of America, held at Columbia University, New York, J. O. Smith presented an interesting paper which decribed in detail the amateur continuous-wave radio set used at station 2ZL. The constants of all parts of the apparatus and circuits were given. The station described is a well-equipped amateur station in the second district, duplicates of the parts used being procurable by amateurs anywhere.

Milton Cronkhite, 115 Worth St., New York, is corresponding secretary of the Radio Club, which was founded in 1909.

Inter-City Radio Communication Service

At 3 p. m. on December 16, Mayor Hylan, of New York officially opened the radio telegraph service of the Inter-City Radio Communication Company between the cities of New York, Cleveland, Detroit and Chicago.

The formalities were conducted in the Mayor's office, City Hall, New York, where about 100 prominent scientists, engineers, telegraph and cable executives and journalists witnessed the sending and receiving of the first commercial radiogram between New York and Chicago.

Addresses were made by Mayor Hylan, Prof. M. I. Pupin, Dr. Lee De Forest and by Emil J. Simon. Mr. Simon, who is a well-known radio engineer, built and equipped the radio stations used in this new service.

Radio Specialties to Be Produced in New Philadelphia Shop

With the perfection of radio telephones has come an increase in demand for delicate electrical instruments. Apparatus for measuring the most minute currents, which formerly was not to be found outside of scientific laboratories has become an everyday necessity. This demand is being met by the Western Electric Company, by the establishment of a factory at Philadelphia, Pa., where what are known as precision products will be made.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.
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The Latest Improved Instantly Adjustable

DIAPHRAGM TELEGRAPH SOUNDER

Requires No Local Battery

Adjustable: Loud Soft, or Silent

Black Enamel Horn

Trouble Proof

Saves Battery Cost

Practically as "Good as New" After Six Years' Service

Diaphragm Sounders have been in constant use in the office of the Norfolk Southern Railroad Company at Fentress, Va.

—More than six years
—Without a single local interruption
—Working just as good now as the day they were installed.
—And from all appearances they will continue to give the same reliable service for many more years.

Diaphragm Sounders perform better service—longer, and at less expense than any other type of sounder. Used by U. S. Govt. and more than 100 Railroads, Pipe Lines and Oil Companies.

Equip your relays with Diaphragm Sounders
Write for Descriptive Folder

RAILWAYS LABOR SAVING DEVICE CO.
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MANUFACTURERS OF THE

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THE UNIVERSAL SELECTOR
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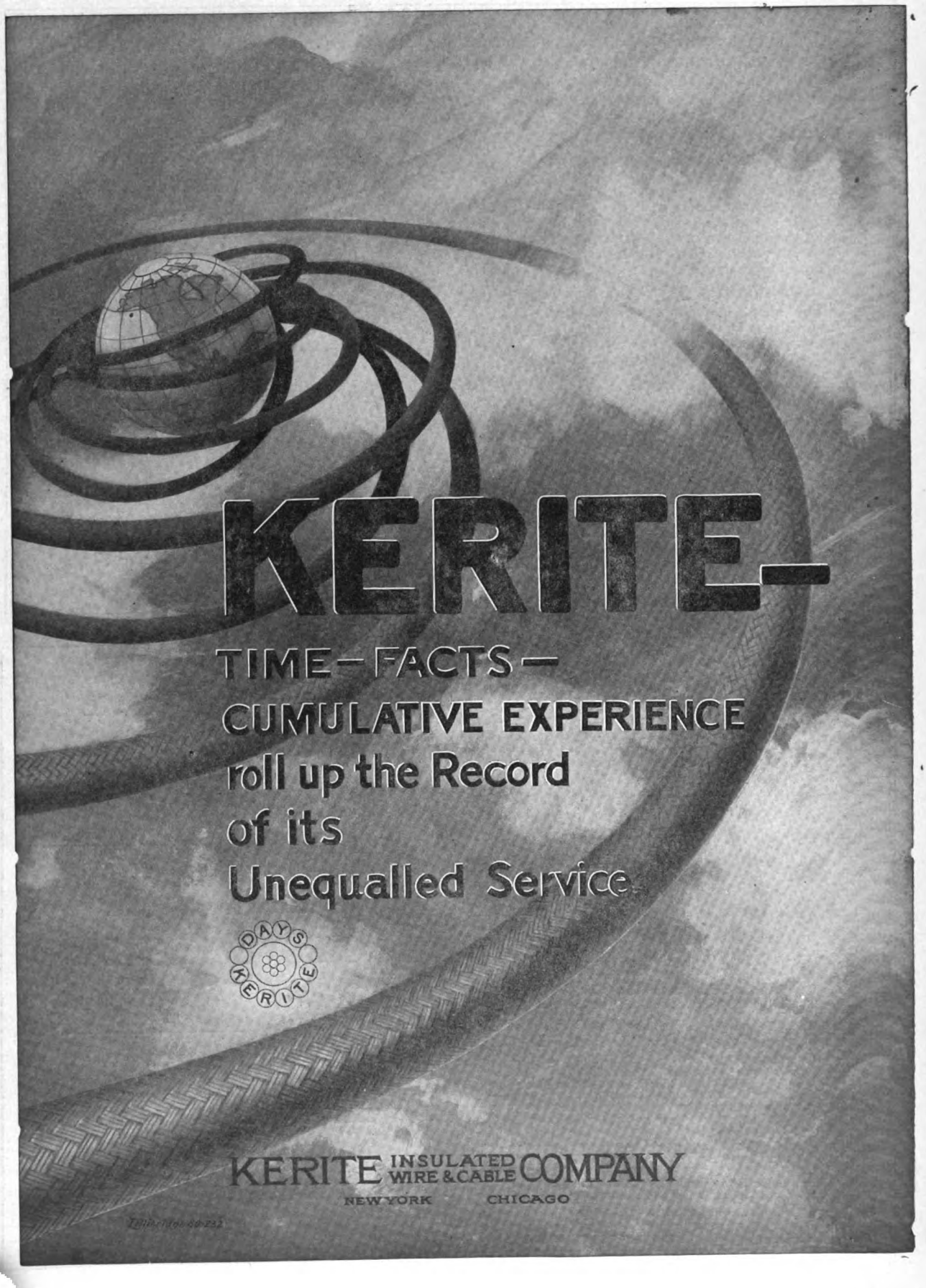

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THE RAILROAD
TELEGRAPH AND TELEPHONE

W. A. FAIRBANKS, of the American Railway Association, is taking a personal interest in the work of the technical committees of the Telegraph and Telephone Section. He attends many of the committee meetings that are held in New York; his thorough knowledge of A. R. A. routine enabling him to aid materially in speeding up the transaction of business.

G. A. CELLAR, general superintendent of telegraph and signals, Pennsylvania Railroad, was a New York business visitor on December 16 and 17.

THE NEXT MEETING of the Telegraph and Telephone Section, American Railway Association, will be held at Atlanta, Ga., on March 23, 24, 25, 1921. Mr. H. Hulatt, chairman of the section, is having noteworthy success in securing the co-operation of the various technical committees in preparing reports and recommendations for the business sessions of the March meeting.

COMMITTEE No. 12, Radio and Wired Wireless, of which J. D. Jones is chairman, held a meeting in the Pennsylvania Depot, New York, on December 3. Members in attendance were: J. D. Jones, L. B. Foley, Donald McNicol and A. R. Belmont. The committee, during the session, consulted successively with the following radio manufacturers' representatives: L. R. Krumm, International Radio Telegraph Company; Robert F. Gowen, De Forest Radio Telephone and Telegraph Company, and Emil J. Simon, of the Inter-City Radio Communication Company.

THE TELEGRAPH AND TELEPHONE DEPARTMENT of the New York Central Lines has developed a method of employing alternating current to operate Gill selectors. The first circuit equipped is the Albany, Little Falls, N. Y., dispatcher's line, No. 9 A. W. G. copper, eighty miles in length, in which thirty-three selectors are connected.

THE SOUTHERN RAILROAD has inaugurated an educational program for managers and wire chiefs of all important offices on the system. Some months ago a questionnaire was sent out by J. A. Jones, superintendent of telegraph, Charlotte, N. C., and by W. S. Melton, superintendent of telegraph, Cincinnati, Ohio, with the object of ascertaining the extent of expert knowledge possessed by men employed at these offices. An analysis of the answers to the questionnaire disclosed the lines along which study should be encouraged. A. W. Beauprie, assistant superintendent, Charlotte, N. C., has taken a keen interest in this educational work.

R. N. YOUNG
Superintendent, Canadian Pacific Railway Company's Telegraphs

R. N. Young, superintendent, Canadian Pacific Railway's Company's Telegraphs, Vancouver, B. C., was born at Cayuga, Ontario, on September 4, 1870. He became an operator on the Michigan Central Railway, November, 1889. He entered the service of the Canadian Pacific Railway, Western Lines, as operator, November 1, 1890, transferred to Fort William, Ontario, May, 1897, and returned to Winnipeg, July, 1901. He was appointed in-

R. N. YOUNG

spector of telegraphs with headquarters at Swift Current, Sask., November, 1904, moved to Regina, Sask., November, 1905, and from there to Winnipeg, Man., September, 1906. He was advanced to the position of assistant superintendent at Winnipeg April, 1907, and appointed superintendent at Moose Jaw, Sask., July, 1910; transferred to Calgary, Alta., August, 1913, and to Vancouver, B. C., March, 1915, as superintendent of the British Columbia district.

THE PLANT DEPARTMENT of the New York Central Railroad proper, and not including Western Union wires, has charge of 6,483 miles of pole line on the railroad company's right of way, with 35,790 miles of wire in railroad use, serving 1,500 stations.

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SUBMARINE CABLE ITEMS

All America Cable News Notes

THE THIRD ANNUAL STAFF DINNER of the All America Cables, Inc., was held at the Whitehall Club, New York, on December 18. The principal address was delivered by Edmund L. Baylies, Chairman of the Board, Mexican Telegraph Company. President Merrill offered a toast to the memory of the late James A. Scrymser, in which he paid deserved tribute to the memory of the founder of the company. The ceremony of adopting an "All America" flag was one of the interesting features of the evening.

F. SCHRILLS is in charge at Buenaventura during the absence of W. J. Butterfield, who is on furlough.

THE SCHOOL maintained by the All America Cables at Barranca, a watering place near Lima, Peru, has graduated a number of promising cable operators during recent months.

Inauguration of Direct Cable From Cartagena to Colon

On October 24, 1920, service was inaugurated on the direct cable that connects Cartagena, Colombia, with Colon, Panama.. This cable was landed at Cartagena during the month of July by the All America Cables, but its use was delayed pending an agreement between the company and the national government as to the conditions that should govern the transmission of messages.

Cartagena has heretofore been connected with the outside world by means of land telegraph to the cable station at Buenaventura on the west coast of Colombia, thence by cable through Panama to the United States. The average length of time required for the transmission of messages under these conditions was about five days. The opening of the new cable gives Cartagena direct connection to the United States.

Additional Submarine Cables

According to *Telegrafi e Telefoni,* the Italian Scruizio del Telegrafi has in contemplation a scheme to lay a series of submarine cables in the peninsula between Genoa and Trieste, two of which have already been laid—namely, Rome to Genoa and Venice to Trieste. The remainder of the scheme comprises eight lines—viz., Fiumicino to Naples, 255 km.; Naples to Messina, 354 km.; Messina to Catania, 104 km.; Catania to Syracuse, 65 km.; Catania-Taranto-Bari, 720 km.; Bari to Ancona, 454 km.; Ancona to Venice, 252 km.; and Spezia to Genoa, 85 km.—or a total of 2,289 km. The cost of the scheme at present prices is estimated at—cables, 30,000,000 lire; and laying same, 300,000 lire. The scheme is motived by the wish to escape atmospheric and electrical inductive effects.

Pacific Cable

According to a statement issued on November 8, by the Pacific Cable Board, during the year ending March 31 last the Pacific cable established a new record, alike in revenue and the amount of traffic handled. The net traffic receipts amounted £642,948, and exceeded those of 1918-19 by £88,-436; £353,000 was appropriated to the reserve and renewal funds, and after meeting all other charges, there remained a surplus of £10,433, which will be applied in reduction of the outstanding balance of the original Treasury advance of £2,000,000. During the year over 9,000,000 paying words of international traffic were handled, over 750,000 words in excess of the total during the previous year, and 300,000 above the previous record number of paying words carried in 1916-17. In addition, approximately 2,320,000 paying words were carried between Australia and New Zealand and between those Dominions and the Pacific Islands, or 480,000 words in excess of the 1918-19 figures. No opportunity, it is stated, presented itself for reinstating the week-end cablegram service, and it is difficult at the present time to forecast the probable date on which it will become possible to resume it. There is, however, reason to anticipate some falling off in the volume of cable traffic within the next few months. If this takes place, and if the cable facilities of other routes are restored to their pre-war capacity, the pressure on the board's system will probably relax sufficiently to enable the week-end cablegram service to be resumed. Government traffic exchanged between the United Kingdom and Australia and New Zealand during the year under review amounted approximately to 2,200,000 words, approximately 1,300,-000 words less than in the preceding year, but still about 2,000,000 words in excess of the number carried during the financial year immediately preceding the war.

Anglo-German Cable Communication

It is semi-officially stated in Berlin that hitherto only three of the six telegraph cables between Emden and the English coast which were damaged during the war have been reopened to traffic, but a fourth cable has now been put in order by British and German ships. Repairs on the other two cables will take some time to complete. It is expected that telegraphic communication with England will be substantially improved by the restoration of the fourth cable.

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Student's Course in Technical Telegraphy

Lesson No. 18

In Lesson No. 17 methods were explained of measuring the conductivity of line wires by means of Wheatstone bridge sets. Practically all terminal offices are supplied with measuring instruments of this kind, and although the connection posts on the bridge instrument are plainly marked as to Line, Battery and Galvanometer, and the means of varying the resistance of the a, b, and R arms of the

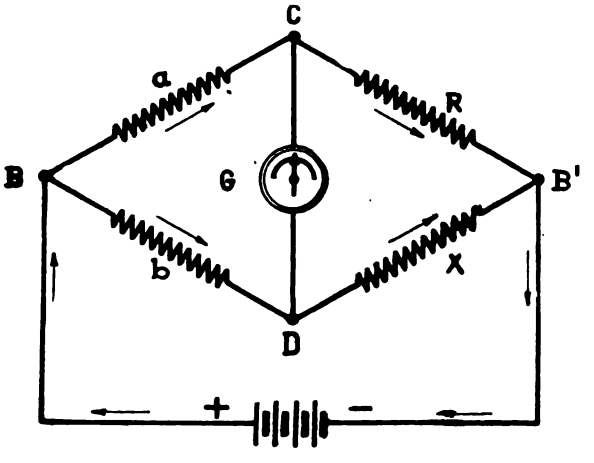

FIG. 36

bridge are labeled so there is little chance of misunderstanding, it is the intention in this lesson to describe the principle of the bridge.

The bridge consists of an arrangement of conductors as shown in Fig. 36. One terminal of a battery is led to the point B, where it divides into two paths which are united again at the point B', so that a portion of the total current flowing passes through the point D, and a portion through the point C. The four conductors a, b, R and X, are called the arms of the bridge. When the resistances of three of these arms are known, the resistance of the fourth arm may be calculated according to the proportions of their values.

There is a fall of potential between the plus battery terminal and the point B; also a fall in potential along the two paths B, a, C, and B, b, D. If the points C and D are equally distant electrically from the point B, and equally distant from the point B', then the potential will have fallen at C to the same value as at D. "Distance," in the sense employed here, refers to resistance in ohms.

If the ratio of the resistance a to the resistance R is the same as the ratio of the resistances b, and X, then the points C and D will be at equal potentials and no current will flow through the circuit C-D, which includes the indicating instrument, usually a galvanometer.

When the resistances of the four arms are equal the proportion reads:

a is to b as R is to X.

When the resistance of the arms a, b, R are known the resistance of X may be determined by means of the simple formula

$$X = \frac{b}{a} R$$

The unknown resistance, that is, the resistance to be measured, is connected between the points B' and D.

When the line wire, magnet winding, or coil, whose resistance it is desired to know, has a resistance not greater than the total resistance of the arm R, the ratio arms a and b may be made equal. Then if the rheostat arm R of the bridge is adjusted until the galvanometer pointer indicates a balance (no current in C-D) it is plain that the resistance X has a resistance the same as R.

When it is desired to measure a resistance greater than the total resistance of the rheostat arm R, the ratio arm b should be so adjusted that its resistance will be higher than the resistance of arm a. To measure very low resistances, the arm b should be given a value less than that of arm a. This is

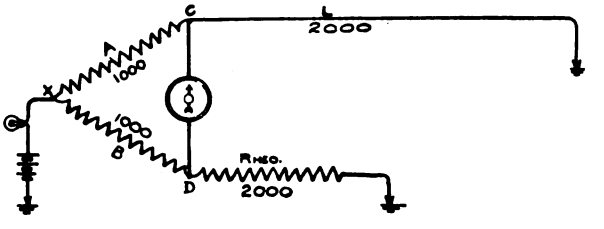

FIG. 37

so that the process of division and multiplication of the formula will be simplified.

Example (1):

a, 10 ohms,
b, 1000 ohms, then $X = \frac{b}{a} = \frac{1000}{10} \times 540$
R, 540 ohms,

$= 54{,}000$ ohms.

Example (2):

a, 1000 ohms,
b, 10 ohms, then $X = \frac{10}{1000} \times 540 = 5.4$
R, 540 ohms,

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Fig. 37 shows the principle of the bridge applied to duplex telegraph circuits. The arms A and B here are shown as having 1000 ohms resistance each; the line wire to the distant station, 2000 ohms, and the artificial line, 2000 ohms. The line occupies the position X in the theoretical bridge circuits while R becomes the artificial line.

The pole-changer armature of the duplex in a working set would be connected at x so that by means of the sending key the battery circuit may be opened and closed in the act of transmitting signals. In a bridge duplex set the galvanometer is replaced by the receiving relay.

Important Papers on Telegraphy

At the midwinter Convention of the American Institute of Electrical Engineers, to be held in New York in February, two important papers are to be presented on communication subjects. Messrs. J. J. Carty and Frank B. Jewett, will present a paper entitled "Carrier Current Telephony and Telegraphy," and Stanley Rhoads a paper entitled "Multiple Use of Wires for Communication Purposes in Railroad Service."

The Telegraphy and Telephony Committee of the Institute has been assigned an entire session of the Midwinter Convention for the presentation of technical papers.

American Engineers Solve Italian Communication Problem

American engineering experts have just completed a three months' period of study for the Italian government to determine the practicability of running a communication cable from Milan, Genoa and Turin without interference from railroad and transmission lines. The investigation was made by Professor Charles F. Scott, chairman of the department of enginering at Yale University, and L. P. Ferris, of California, a noted figure in inductive interference studies. Professor Scott represented the Western Electric Company in the research.

The railway between the three cities, Milan, Genoa and Turin, is in the shape of a "Y." Part of it is already operated by electricity, while the rest soon will be. The experts have gathered together valuable data regarding inductive interference and three-phase lines under the peculiar conditions which exist in Italy. They have also suggested a route that will practically free the proposed communication cable from outside disturbances.

Telegraph Men Who Are Members of the American Institute of Electrical Engineers

The Blue-book of the American Institute of Electrical Engineers shows the names of 535 telegraph and telephone engineers as Fellows, Members or Associates.

A few of those directly engaged in telegraph work, who are identified with the Institute are:

In the service of the Western Union Telegraph Company: J. P. Edwards, R. E. Chetwood, H. W. Drake, G. M. Yorke, A. Lyons, M. H. Clapp, L. B. Bass, W. N. Fashbaugh, W. W. Drew, A. S. Dana, F. E. D'Humy, D. C. Brundage, E. R. Shute, A. Z. Mample, G. W. Janson, Everett Harvey, Thomas C. Harlan, L. H. Williams, M. A. Frye, J. E. Jenkins and J. W. Milnor.

In the service of the Postal Telegraph-Cable Company: J. P. O'Donohue, H. C. Shaw and John H. Mayer.

Others are: H. Hulatt, manager of telegraphs, Grand Trunk Railway, Montreal; Charles E. Davies, general superintendent of traffic, Great North Western Telegraph Company, Toronto; G. A. Cellar, general superintendent of telegraph, Pennsylvania Railroad, Philadelphia; Stanley Rhoads, telegraph and telephone engineer, New York Central Lines, New York; I. C. Forshee, electrical engineer, Pennsylvania Railroad, Philadelphia; H. L. Graham, Baltimore and Ohio Railroad, Jenkins, Ky.; L. Behner, assistant superintendent of telegraph and signals, Pennsylvania Railroad, Pittsburgh, Pa.; G. H. Mayer, superintendent of telegraph, Soo Line, Stevens Point, Wis.; W. R. Birt, Southern Pacific Railroad; M. A. Noss, engineer, Telepost Company, New York, and H. L. Krum, of the Morkrum Company, Chicago.

Telegraph engineers, wire chiefs and testing and regulating assistants who wish to identify themselves with the Institute may obtain application forms from Donald McNicol, chairman of the Telegraphy and Telephony Committee, 253 Broadway, New York.

Reason Enough

"Why did you strike the telegraph operator?" asked the magistrate of the man who was summoned for assault.

"Well, sir, I gives him a telegram to send to my gal, an' he starts readin' it. So, of course, I ups and gives him one."—*London Tit-Bits.*

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Canadian Telegraph Items

GREAT NORTH WESTERN TELEGRAPH COMPANY BECOMES CANADIAN NATIONAL TELEGRAPHS

The letters G. N. W. and the name they indicate —the Great North Western Telegraph Company, long familiar to every Canadian, whatever his position or walk in life—manufacturer or business man, financier or merchant, public man or ordinary citizen—are eventually to disappear. The Great North Western Telegrah Comany is now a branch of the national system, and is to be known, after January 1, 1921, as the Canadian National Telegraphs.

The history of the Great North Western Telegrahp Company covers a period of precisely forty years, the company having been organized in 1881, when it leased the lines of the old Montreal Telegrah Company and the Dominion Telegraph Company and merged them into one system. From that date on the G. N. W. grew steadily, and in correspondence with the growth of the country, spreading out and extending its lines until they covered practically all eastern Canada with a veritable network of wires, while it materially increased its foothold in the west.

In 1915 control of the G. N. W. was acquired by the Canadian Northern Railway, and the railway's already extensive commercial telegraph system being combined with that of the G. N. W., the latter became for the first time a practically Dominion-wide organization. In 1918 the Canadian Northern Railway System, with the G. N. W. and its other subsidiaries, came into the hands of the Dominion government, followed subsequently by the Grand Trunk Pacific Railway, when the two great systems, together with the National Transcontinental Railway, were co-ordinated. The telegraph lines of the National Transcontinental Railway were placed under control of the G. N. W., and now arrangements have been completed for the co-ordination with the G. N. W. and its associated lines of the telegraph lines of the Grand Trunk Pacific.

The first general manager of the Great North Western Telegraph Company was H. P. Dwight, who held the position until 1903—that is, for 22 years—when he made way for Isaac McMichael, a Canadian by birth, who had won a name for himself in the telegraph world in the United States. Mr. McMichael died in 1911, and was succeeded by George D. Perry, who, entering the service of the G. N. W. as a young man, had worked his way up by sheer ability and energy to the double position of secretary-treasurer. Mr. Perry continues with the new national system as general manager, the other principal officials being A. C. McConnell, secretary and auditor; D. E. Henry, treasurer; Chas. E. Davies, general traffic superintendent, and W. G. Barber, general commercial superintendent.

The head office of the new system remains in Toronto, the executive staff occupying commodious quarters in the World Building on Richmond Street West.

THE JURISDICTION of George D. Perry, general manager, has been extended over the telegraph lines of the Grand Trunk Pacific Railroad. The following appointments have been made: Charles E. Davies, general superintendent of traffic, Toronto, Ont.; E. Kenward, superintendent of railway service, Eastern Division, Toronto, Ont.; R. M. McMillan, superintendent of railway service, Western Division, Winnipeg, Man.; G. H. Walters, district commercial superintendent, Montreal, Que., B. S. Round, district traffic superintendent, Winnipeg, Man.; H. K. Clarke, chief electrician, Toronto, Ont.; George T. Trowhill, supervisor of wire service, Toronto, Ont., and C. C. Stewart, supervisor of traffic, Toronto, Ont.

THE EXECUTIVE STAFF of the company formally took possession of their new quarters in the World Building, 40 Richmond St., Toronto, on December 6. The occasion was taken by his associates to present General Manager Perry with a handsomely engraved fountain pen, bearing his initials. Presentation was made by W. G. Barber, general commercial superintendent.

ARTHUR DESCOMBES, of the Quebec City office, died on October 31, after a short illness.

—— ——o——

W. J. CAMP, assistant manager, Canadian Pacific Railway Company's Telegraphs, Montreal, Que., has sent to the historian of the Old Time Telegraphers' and Historical Association, the original of a telegram sent from Toronto, Ont., on August 28, 1848, addressed to a party at St. Catharines, Ont. The telegram was sent over the lines of the Toronto, Hamilton, Niagara and St. Catharines Line.

——————o——————

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

J. FRANK HOWELL, the well-known broker of New York and an old-time telegrapher, a former president of the Consolidated Stock Exchange, was in Washington recently as a witness in one of the numerous investigations now going on in the Capital. Mr. Howell entertained old Washington telegraph friends the three evenings that he spent in the city.

COL. B. O. LENOIR, heretofore in charge of the Alaska cable service, United States Signal Corps, with headquarters at Seattle, Wash., has been transferred to Baltimore, Md., as chief signal officer of the Third Army Corps area.

STERLING MORTON, president, and HOWARD L. KRUM, general manager, of the Morkrum Company, Chicago, were New York business visitors on December 17.

W. J. LLOYD, formerly general manager of the Western Union Telegraph Company, Denver, Colo., now retired, is in New York accompanied by his wife. His brother-in-law, W. R. Hollingan, formerly chief operator of the Western Union main office, Chicago, and for the past fifteen years in the brokerage and bond business in New York City, is seriously ill at his home in this city.

W. J. MAGUIRE, well known in telegraph circles throughout the country, who has for some months past resided in California, has returned to Canada and is located at Kamloops, B. C.

A. C. NOLTE, for some years with the American Telephone and Telegraph Company, has established an office at 165 Broadway, New York, as a patent attorney.

MISS FLORENCE WILSON, daughter of the late Colonel William Bender Wilson, president of the Society of the United States Military Telegraph Corps, and a former well known telegrapher of Philadelphia, has been elected chief of the book department of the International Society at Geneva, Switzerland. Miss Wilson is rendering a satisfactory service to the Peace Commission, with which she has been identified for the past year.

POSTAL TELEGRAPH-CABLE COMPANY

C. M. BAKER, general superintendent of plant, Chicago, Ill., was an executive office visitor a few days before Christmas.

D. H. GAGE, division engineer, Eastern Division, has returned from a trip to offices in northern New York State.

H. D. REYNOLDS, superintendent, Buffalo, N. Y., and J. W. WEED, manager at Syracuse, N. Y., were recently photographed together in characteristic poses by a photographer for the Syracuse *Post-Standard*, the reproduction appearing in the Sunday illustrated section of that paper of November 28.

MANAGERS APPOINTED: A. J. Daniel, Cartersville, Ga.; W. W. Garland, Fayetteville, N. C.; H. D. Cooksey, Henderson, N. C.; Z. M. Potts, Washington, N. C.; H. H. Kingin, Muskegon, Mich.; B. E. Ikard, Socorro, N. M., and J. D. Prosser, Williams, Ariz.

New York Postal Items

A. J. MOTTO, southern quad chief, on the early night force, has been appointed day traffic chief, main office.

J. D. SAYERS has been appointed southern quad chief, main office.

THE FOLLOWING OPERATORS have returned from their vacations: J. P. McGuire, V. Vecchio, J. Vitelli, L. Cohen and Miss K. Lowe.

E. E. MCCLAFFERTY, formerly attached to the cable office staff, 20 Broad Street, has been assigned to a position in the Produce Exchange office.

H. COONEY has been assigned to the branch office at 45 Broadway.

J. J. BARRY, formerly at the Leonard Street office, has been appointed manager of the office at 127 Duane Street.

H. MORITZ, formerly operator at the 45th Street office, has been transferred to a branch office further uptown.

B. J. FERACA has been appointed manager of the office at 42nd Street and Broadway.

MISS R. SEIKEN, formerly of the Fourth Ave-

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nue and 28th Street office, has been transferred to the sugar district office at Wall and Front Streets.

MISS LUNDIN has been appointed operator at the Fulton Market office.

LESLIE GARDNER has been appointed manager at Everett, Wash.

NEW MOTOR GENERATORS have been installed in the office at Salem, Ore.

MISS CHARLOTTE HOLLISTER has been appointed manager at Grants Pass, Ore. Miss Hollister learned the business in the Spokane, Wash., office.

G. E. PILCHER, chief clerk to Superintendent Patton, was an official visitor at offices in Montana during December.

MESSENGERS ANGELL and FLAKS, of the Seattle office, have entered the telegraph business to stay. They are engaged building a practice line between their homes. In a short time they will be competent operators.

N. E. NIXON and E. A. HOLMES have joined the operating staff of the Portland, Ore., office.

A FALL OF FOUR FEET OF SNOW in the Cascade Mountains in December caused some interruption to lines. The mountain linemen on snowshoes soon cleared the trouble.

THE OFFICE at Great Falls, Mont., is being renovated and brought up to date in appointments.

A Valuable Book for Students

"Telegraphy for Beginners," the standard method, an authoritative book of instruction in the methods and forms most approved, with lessons; including the Morse and Continental Codes, by Willis H. Jones, second edition revised to date, 58 pages, 19 illustrations. Paper cover, 35c.

Contents of chapters: 1. Introductory remarks, practical advice and important rules to observe. 2. The Morse alphabet and other characters, with lessons. 3. Signals and abbreviations. 4. Sporting events and market reports in tabulated form. 5. The student's outfit and practice circuit with diagrams of connections. 6. How to adjust the sounder. Adjustment of key. Connections for main line and sounder, etc. With the Morse alphabet and the Continental code. Including facsimiles of the latest forms of telegraph blanks, showing how they are filled in.

Send orders and make remittances to J. B. Taltavall, Publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

THOSE RESIDING in New York and vicinity wishing to purchase Diaphragm Telegraph Sounders will find these instruments on sale in the office of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York. The price of these instruments is $5.00 each. There is an increasing demand for these sounders, and those in need of them will no doubt be glad to learn that they are now obtainable in New York.

Buffalo, N. Y., Postal Items

ROBERT J. LITTLE, manager at Rochester, N. Y., was a visitor at the superintendent's office in December.

E. W. ROUSE, of the Buffalo main office, is spending a week with friends at Springville, N. Y.

J. H. MCGOWAN and J. TRACEY, operators, are away from duty on account of illness.

EMILY MORIARTY, of the Buffalo office, is spending the holidays with her parents at Medina, N. Y.

Philadelphia, Pa., Postal Items

C. E. BAGLEY, superintendent, Philadelphia, recently visited the offices at Washington, Baltimore and Wilmington.

ELLA C. BRENNAN, of Pottsville, Pa., has been appointed manager at Westchester, Pa., vice Mrs. E. Himelright, resigned to enter other business.

W. L. GLASCOCK has been added to the manager's staff at Baltimore, Md.

C. A. MILLER, heretofore manager at Chester, Pa., has been appointed night wire chief at Harrisburg, Pa., vice C. E. Kline, who has accepted service with the American Telephone and Telegraph Company.

L. B. BICKERTON, formerly with the Western Union Telegraph Co., at Washington, D. C., has been appointed assistant to Manager Thomas P. Dowd, Washington.

R. E. COXEY has been appointed operator at Lancaster, Pa.

M. A. BAKER, wire chief, Philadelphia, has returned to duty after a ten days' sick spell.

J. J. MAHER, formerly of Norwich, Conn., has been appointed manager at Princeton, N. J.

Seattle, Wash., Postal Items

B. W. FIELDS, division engineer, San Francisco, was in Seattle and Portland in December in connection with the new long distance telephone service.

An Electrical Education

Every student of the telegraph, telephone and radio should have in his library an authoritative textbook on the elements and principles of electricity and magnetism.

There has recently been published a new book containing 590 pages of up to date matter, entitled

ELEMENTARY ELECTRICITY AND MAGNETISM

By JACKSON and BLACK

And we can highly recommend it to our readers

$2.50 per copy

From TELEGRAPH AND TELEPHONE AGE

253 Broadway, New York

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WESTERN UNION TELEGRAPH CO.

R. F. MURPHY, supervisor of athletics, and his assistant, A. Roche, are engaged in arranging for an athletic meet to be held on January 8 at the 22nd Regiment Armory, New York.

O. J. NOURSE, inspector, general traffic department, New York, is on a trip of inspection to repeater stations between New York and North Sydney, N. S.

A DEVELOPMENT MEETING was held at Oklahoma City, Okla., on November 18, 19 and 20, under the direction of F. A. Mohr, general manager, Dallas, Texas. On the 19th a banquet was given at the Huckins Hotel. Those in attendance included: F. A. Mohr, general manager; A. C. Kaufman, general commercial agent, New York; G. P. Brinkley, division commercial manager; R. P. Napier, division commercial manager; W. T. Germany, chief operator, Oklahoma City; F. H. Austin, district commercial superintendent; E. E. Louderbeck, division commercial manager, and managers from all of the principal offices in the third district, Gulf Division.

THE NEW YORK-SEATTLE direct printing telegraph circuit which was opened on December 10 is the longest of the Western Union Telegraph Company's transcontinental circuits. It is routed as follows: New York, Chicago, Minneapolis, Helena, Spokane to Seattle. The total pole mileage involved is 3,381 miles. Four simultaneous transmissions in each direction take place over this circuit, the capacity in telegrams being 225 per hour in each direction. The line wire is of No. 9 gage copper, 210 pounds to the mile, supported on poles 110 feet apart throughout the entire distance.

E. T. MOORE, formerly of Jackson, Miss., is now identified with the office of J. F. Wilson, district commercial superintendent, Dallas, Texas.

Western Union, Eastern Division

F. H. JEWELL, manager at Liberty, N. Y., is recovering in a hospital at Middletown, N. Y., after undergoing an operation for appendicitis.

G. H. SCHMIDT, manager at Saratoga Springs, N. Y., is spending his vacation in New York City.

G. W. TRACEY has been appointed manager at Pittsfield, Mass.

THE ANNUAL CHRISTMAS PARTY of General Manager Carroll's staff was held Friday afternoon, December 24. A beautifully decorated Christmas tree set in a huge Jack Horner was one of the features. There were presents for all, from the boss to the office boy. Two hours of song, dance and general jollity was indulged in by a happy and enthusiastic staff. President Carlton and Vice Presidents Willever and Fashbaugh visited the celebration and left their blessings.

A. M. PEARSON, formerly district commercial manager, has been appointed district commercial agent and takes charge of development work. With eighteen years of experience as manager and district commercial manager to his credit his many friends and associates expect Mr. Pearson to have equal success in his new position.

C. O. FLINT, formerly manager at Rocklands, Me., has been appointed district commercial manager, vice A. M. Pearson. Mr. Flint was manager at Plattsburg, N. Y., during the war, and was transferred to Rockland in September, 1920.

New York Western Union

AT THE REGULAR MONTHLY MEETING of Association Western Union Employees, Clerical Assembly No. 80, held on December 9, the following officers were elected to serve during the year 1921: James C. McCormick, president; Louis Kalichstein, secretary-treasurer, and on the Grievance Committee: Alvin Scherb, Joseph T. Carroll and Dominick Fazzalaro.

AT THE regular monthly meeting of the Morse Local, No. 101, held on Tuesday evening, December 7, the following officers were elected for 1921: President, John J. Keefe; secretary-treasurer, Gertrude B. McMullen; grievance committee, John Cashman, T. F. Elliott and Alice G. Knuff. The Local is to be commended for its selection.

Western Union, Lake Division

W. T. MCCLAIN has been re-elected president of Local 51, Association Western Union Employees, Cincinnati, Ohio.

A MANAGERS' MEETING was held in Cincinnati, Ohio, Monday, November 29th, attended by about twenty out-of-town managers and a number of the local branch managers. Various commercial activities were discussed, the principal topic being in connection with the campaign of publicity to be inaugurated upon the completion of the South American cable. The meeting was honored with the presence of General Manager Cronkhite and Division Commercial Managers Allen and Ragsdale.

SEVERAL ADDITIONAL changes in managers have recently been made, among them: E. A. Densmore, transferred from Xenia to Niles; L. N. Taylor, Orrville to Xenia; J. E. Tierney, Kenton to Lorain; Relief Manager C. A. Harmon, temporarily assigned to Kenton.

MANAGER C. H. TOWNS, Steubenville, Ohio, is absent account sickness, his place being filled temorarily by Relief Manager Robenalt.

A NEW Class 1 office was opened at Leetonia, Ohio, on December 1, replacing the Class 4, Penna. Railway office previously operated at that point.

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THE FRIENDS of Operator I. E. Ward, Findlay, Ohio, formerly manager at that point, will regret to hear of his serious illness.

WALTER BRANCH, Middleport, Ohio, has returned to duty after a three months' furlough.

MRS. MARIE G. WALKER, who has been in the service of the Western Union Telegraph Company at Milwaukee, Wis., continuously since January 3, 1892, has gone to New York to live with her daughter, who recently returned from abroad after completing five years' study for grand opera. Mrs. Walker was the recipient of a handsome pair of silver candlesticks with hand decorated candles, a filigre gold brooch set with a solitaire pearl, and a gold pencil. These gifts were given by employees in all departments as a token of the esteem in which Mrs. Walker is held by them. She is a woman of exemplary character and high ideals, and will be greatly missed by her co-workers.

LET DIOGENES cast away his well-known lantern. The honest man is found. He is John Graybill, familiarly known as Messenger No. 11, in the Cincinnati, Ohio, office. Just the other night a man handed him a five dollar bill in payment for a one dollar telegram. Graybill did not discover the error until he returned to the office, where he reported the incident and the mistake was rectified. Graybill was at one time a school teacher, which occupation he forsook for one more prolific of remuneration. His education in the matter of honesty was not neglected, it seems, in spite of the miserly wages the pedants receive today.

G. E. ROBERTSON has been appointed to a position in the testing and regulating department, Oklahoma City, Okla., office.

R. J. PHILASTRE, multiplex attendant, has been transferred from Tulsa, Okla., to Oklahoma City, Okla.

W. J. Doherty Returns From Mexico

W. J. Doherty, wire chief, Chicago, Milwaukee and St. Paul Railway Company at Miles City, Mont., recently returned from the City of Mexico, where he made an extensive stay. Mr. Doherty states that he was never better treated in his life than during this most enjoyable trip. The population of Mexico City is one million eighty thousand, and the climate is beautiful on account of the altitude, 7,500 feet.

Mr. Doherty states that the whole cry now is American capital, and the people will really put themselves out at every turn to accommodate an American. It is probably a little cheaper to live in Mexico than in the United States. Mr. Doherty has a knowledge of Spanish, which enabled him to converse with the natives, and which aided in making his presence welcome everywhere. He thinks that there are excellent opportunities in Mexico for enterprising Americans.

Radio Factory Fire Interrupts Wire Lines

About midnight on November 18, the manufacturing plant of the De Forest Radio Telephone and Telegraph Company, at High Bridge, New York, caught fire and was partly destroyed.

It happens that the Postal Telegraph-Cable Company has a fifty conductor cable on a pole line which runs past the De Forest plant, and a short time after the fire started this cable was burned away over a length of one hundred feet. The cable carries forty-six important telegraph circuits to New England points.

Quick work on the part of Thomas Tierney, night manager of the Postal Company's New York main office, aided by several line foremen, resulted in the circuits being restored to service before 10 o'clock the following morning.

New Book on Vacuum Tubes Used in Radio Signalling

Dr. H. J. Van Der Bijl, until recently research physicist in the service of the Western Electric Company, New York, has written a book entitled "The Thermionic Vacuum Tube and Its Applications," which is a valuable addition to the present works on the subject of radio-telegraphy and radio-telephony.

The rapidly extending use of the vacuum tube as a receptor of radio waves; generator of radio oscillations; telephone repeater; alternating current rectifier, and for other purposes, has made the instrument one of the most widely discussed inventions of recent times.

Dr. Van Der Bijl, in his book, gives a thorough treatment of the entire subject of thermionics as related to vacuum tube phenomena. In the main the work is mathematical, but the mathematical deductions are clearly interpreted in the text so that the average reader may add substantially to his knowledge of this fascinating subject.

The book has 282 pages and 232 illustrations. The price is $5.00 per copy. From TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

American Radio Relay League

The American Radio Relay League, an organization of amateur radio enthusiasts located in all parts of the United States, has divided the country into divisions which are in charge of division managers. The work carried on by the League is highly beneficial to amateurs.

The officers of the League are: Hiram Percy Maxim, president; Charles A. Service, Jr., vice-president; F. H. Schnell, traffic manager; A. A. Herbert, treasurer; K. B. Warner, secretary, and editor of the official organ, "QST."

The headquarters of the League is at Hartford, Conn.

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A TOAST TO A GOOD MAN

When the grandstands are rocking under the mad enthusiasm of the crowd as Ruth hits his home run in the ninth inning, or Koehler smashes through to a touchdown; when Leonard is swinging the finishing punch, and a wild mob storms the ring, breaking through benches and chairs, one man remains calm.

When the bitter wind is whipping across the field so cold that it chills the marrow and paralyzes the limbs; or the rain is pouring down, soaking through clothing, and dripping into the eyes, one man sits oblivious to the weather.

In the evening, or in the morning, you pick up your newspaper and read columns of descriptions of some great sporting event, and you may, occasionally, reflect that the reporter did fairly well under the circumstances.

But did you ever give a thought to the fellow who sits up yonder in the press stand beside the reporter, picking away at a telegraph key—to the telegraph operator?

There he sits, imperturbable in moments of the greatest excitement, scarcely looking up as sport history is passing under his very nose, his head slightly bent to catch the babble of hurried dictation, or taking hastily scrawled sheets of "copy" and deciphering the words by some occult method of his own, without interrupting the writer.

Sometimes he has to shield his instrument from the elements as best he can, often his hands are so stiff with cold that he can scarcely bend the fingers, and not infrequently as darkness draws over the scene, he has to light matches to see the "copy."

We wish to arise at this time and propose a toast to that lonely figure trudging yonder through the fast gathering night, or out of the darkening hall, the first to arrive at the scene of action, and the last of all the great crowd, there assembled, to leave.

We drink, in grape juice, or carbonized water, or whatever else is to be had, to the long life and prosperity and happiness of a good man, the Western Union or the Postal Telegraph operator.—Damon Runyon, in the *New York American.*

THE CABLESHIP *Restorer,* belonging to the Commercial Pacific Cable Company, arrived at Seattle on December 22, from Cape Beale, where the ship was engaged repairing the Pacific cable. Captain Combe reports encountering rough seas while engaged in this undertaking.

A WAG wants to know where a fellow went to fasten his stocking garter before public telephone booths were located at so many convenient points.

WANTED—A Yetman Transmitter; state price and condition of machine. Address, Yetman Transmitter, care TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

OBITUARY.

SAMUEL A. DUNCAN, aged seventy-one years, of Atlanta, Ga., died on December 4th. Mr. Duncan was prominent in telegraph and electrical circles, until fifteen years ago, when he retired to engage in other business. Mr. Duncan was a resident of Pittsburgh, Pa., for many years, and was active in telegraph circles until the advent of the electric light, when he engaged in its development. He was president of the National Electric Light Association for one year. He was also president of the Old Time Telegraphers' and Historical Association. Re-entering the telegraph service in 1896, he became general superintendent of the Postal Telegraph-Cable Company, with headquarters at Atlanta.

A. C. CHATMAN, JR., aged fifty-six years, a well-known old-time telegrapher, died at Philadelphia on December 12th. He was a native of the Quaker City, and began his telegraph career as a messenger, passing through all of the various grades. He was the manager of many important branch offices and was identified with the Baltimore and Ohio Telegraph Company during its career. He drifted into the brokerage business many years ago, and was an extensive employer of telegraphic help. A few years ago he engaged in the hotel business at Atlantic City. Mr. Chatman was of a lovable disposition and everyone in the telegraph service was his friend. He practiced charity to a fault. He was a member of many fraternal organizations. He is survived by his wife and two sons.

M. J. SUNDERLAND, of the Commercial Cable Company, died at Havana, Cuba, November 27, 1920. He was born in London, England, October 5th, 1872. Mr. Sunderland entered the service at Waterville, Ireland, in 1899, where he was stationed for seven years.

EDWARD ALDEN, aged seventy-five, for many years in the accounting department, Postal Telegraph-Cable Company, New York, died at his home in Brooklyn, N. Y., on December 16. Mr. Alden was a descendant of John and Priscilla Alden of the *Mayflower* Pilgrims.

FRANK M. JONES, aged 72 years, who has been on the Western Union pension list for the past two years, died on December 2nd. Mr. Jones was well known in New York and Washington, he having worked in the former city in the seventies and for the following thirty years in Washington. The pall-bearers were George Diven, John Lombard, Jack Riley, Captain King of the War Department and D. F. Brown.

DAVID P. SHEPHERD, aged eighty-two years, an old time telegrapher and an uncle of Governor-elect Neff of Texas, died at Houston, Texas, on December 19. In 1861 Mr. Shepherd was the only superintendent of telegraph in Texas. He built the first telegraph line across Texas from Shreveport, La., to Brownsville. For many years past he had been in the real estate business.

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Telegraph and Telephone Age

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CONTENTS

Railroad Telegraph Operators Trained in Railroad Company's School.. 26
Fundamentals of Engineering Success 27
Hearts Content Cable Station. By H. W. Morehouse..... 28
Concerning the Prepayment of Cable Messages..... 29
Quotation Relative to Radio Laws. Reconstruction of Telegraph and Telephone Systems in Belgium. Do Not Hesitate to Ask Questions. Salvaged Old Submarine Cable 30
Jean Gegou Becomes Manager of the French Cable Company. E. C. Sweeney, Manager of the French Cable Company, Retires..... 31
Work. By Mercer P. Moseley 32
Western Union Reopens Suit Against Louisville and Nashville. Dr. J. T. Morehouse Dies..... 33
Duplex Wireless Telephony and Selective Reception. Germans Multiply Wireless 34
Editorial. Cable Conference Reopened. The Western Telegraph Company's Annual Report. Cuba Prevents Landing of Barbados Cable 35
Captain James Adams Killed. A Thought for 1921. Old Farmer Lawton 36
The American Railway Association and the Metric System..... 39
System and Equipment for Automatic Switching Telegraph Circuits and Operating Positions. Telephone Connecting Cuba and the United States 40
Students' Course in Technical Telegraphy. By Louis Casper..... 41
Students' Course in Technical Telegraphy (Continued)..... 42
Radio Corporation of America. Wireless Phone Sends Church Music Broadcast. All America Cables. Heroes of the Telephone Will Get Valor Medals 43
Current Events. Personal. Postal Telegraph-Cable Company..... 44
Western Union Telegraph Company..... 45
Western Union Telegraph Company (Continued)..... 46
Western Union Telegraph Company's New Chicago Building. Western Union Traffic Department at Dallas Now in Its New Quarters..... 47
French Wire Service in Poor Condition. Automatic Telephony in New York City. Automatic Telephone Switchboard. Telegraph and Telephone Life Insurance Association. Amalgamation of Japanese Electrical Enterprises 48

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Railroad Telegraph Operators Trained In Railroad Company's School

If a stranger were to ascend to the second floor of the big New York Central Station in Utica, N. Y., and enter a long room extending almost the entire length of one side of the building, he would see probably forty or fifty young men busily engaged, bending over the telegraph keys or writing out messages on the typewriter as they come in, or deeply engrossed in the study of textbooks. The continual clicking of so many keys would easily lead the visitor to believe that he has wandered into the operating offices of some big telegraph company.

But such is not the case. This is simply the Telegraph School of the New York Central Lines, where the company trains its prospective telegraph operators and teaches the young idea how to shoot Morse back and forth over the wires.

The Telegraph School was established in 1907 in Albany. The Central also established another school in Rochester at the same time. Since then, the two have been combined and moved in 1919, to Utica. Grant Johnston, who was at the head of the Albany school, is now in charge at Utica.

The object which the officials of the railroad had in mind in organizing this school was to enable the company to have a constant supply of telegraph operators on which to draw. And by "operator" we do not mean one who simply understands the Morse code and is able to send and receive messages, but a man who is fully equipped as a telegraph operator, who can step into a vacancy practically anywhere on the line, knowing enough about railroad procedure to "carry on."

Course is in Sections

With this end in view, the instruction which the student operator receives is divided into regular day classes. For example: Wednesday afternoon is given over entirely to drill in the rules of railroad signaling, blocking trains, etc.; all day Thursday is devoted to the handling of freight matters; on Friday telephone and telegraph, and so on, exclusive of Saturdays and Sundays.

In handling freight work each student acts as an agent. His desk is his station, and from his "office" he bills and receives freight to and from other students just like a "sure enough" agent. Other specified time is used in the handling of passenger tickets. And through it all, the student uses the regular railroad blanks, filling them out and familiarizing himself with each series.

In instructing the student in telegraphy proper, he is first given the use of a "local circuit key," which is not connected with anyone else, but on which he may practice, under an instructor, the sending of messages. The local circuit keys, however, are so arranged that they can, when desired, be connected with outside circuits, and messages be received on one or on all of the students' keys.

There are always some forty or fifty students in the school, and the personnel is constantly changing. As soon as one is qualified, in the opinion of the instructor, to hold down a job, he is placed upon a "ready" list until called for by the company. There is rarely, if ever, even the slightest delay in the placing of student operators, as the New York Central is always in need of men who are fitted to fill positions as operators.

Mr. Johnston, who takes a lively personal interest in "his boys," said:

"They are for the most part fine young fellows, lads who are anxious to make a success at railroading, and who believe that this is the best and quickest way to go about it. The greater proportion of them come to us from the country districts of New York, though some are from New York City, and quite a few, at present, from here in Utica.

"The New York Central endeavors to make them feel that they are part and parcel of the force of Central men, even while they are still students. Although each student is charged a nominal sum for tuition and books, this amount is refunded to him after he has been a certain length of time in the company's service. If anything, the student comes out ahead financially when he finishes his course, as the company pays each one an equally nominal sum in order to place them technically on the payroll, and furnishes him with a free pass to and from his home.

Approved by U. S.

"A great many of our boys are ex-service men who are taking advantage of the Vocational Training Law. Their bonus checks are sent here to the school, and we in turn hand them to the students.

"We have a practice telephone installed in the school, and I am endeavoring to arrange to have it connected with outside railroad wires so the students may 'listen in' on the train instructions, and thereby learn about dispatching, etc. Also, we endeavor to teach them the touch system of typewriting so that they may transcribe the messages on the machine.

"The requirements for entrance into the school are not rigid. The applicant must be over eighteen and of sufficient intelligence and general education to enable him to do the work. Besides, it is usual to require him to sign an agreement to work a given length of time for the New York Central. There is no fixed length of time for instructing the student. We simply keep him here until we think he is qualified for regular work. The company has been taking them from school at the rate of four or five a month lately. At times girls have been accepted, though that is out of the ordinary."

The great advantages of attending such an institution as the New York Central Telegraph School are readily apparent. After leaving the school there

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is not the long period of waiting or of "breaking in" on a job that must be faced by men who have studied at many business colleges which teach, or profess to teach, telegraphy.

The expense is negligible in the case of the company's school, and the student, if he applies himself, is sure of a position.

It is possible for him to advance from agent to train dispatcher, chief dispatcher, assistant superintendent—in fact, as far as his ability will carry him. Many a high official of the railroad has started at the telegraph key.—*New York Central Lines Magazine.*

Fundamentals of Engineering Success

Probably ninety-nine per cent. of young men who have received diplomas which entitle them to place after their names letters signifying their entrance into one of the many branches of the engineering profession feel that the most important factor in achieving success will be their ability to develop, along practical lines, the technical knowledge acquired during their undergraduate days. The importance of this factor is self-evident, but that it is the most important factor is far from true. Men of high technical attainments, even when coupled with industry and good habits, have failed to attain success commensurate with their professional knowledge. The principal reason for failure is set forth in an interesting article in a recent issue of *Marine Engineering.*

Mr. W. D. Keefer, the author of the article referred to, holds that technical schools and universities may turn out men capable of dealing with problems which involve materials, machines and forces of nature, but who have had no training necessary to successfully solve problems involving men. Striking proof of the importance of this phase of engineering is shown in the result of an investigation conducted by the Carnegie Foundation. Beginning in 1915, Dr. Mann sent out questionnaires to leading engineers all over the country asking what elements they considered most essential to the professional success of the engineer. Over six thousand replies were received. Every student engineer should "read, mark, learn and inwardly digest" the following tabulation of these replies:

Character	24 per cent.
Judgment	19½ per cent.
Efficiency	16½ per cent.
Understanding	15 per cent.
Knowledge of fundamentals	15 per cent.
Technique	10 per cent.
	100 per cent.

Judgment, efficiency and understanding of men might be considered phases of character, and we are not far wrong in saying that in the opinion of over six thousand leading engineers character accounts for 75 per cent. of their success. It is obvious that there is no intention to underrate the value of technique, but rather to show that its maximum usefulness in developing a professional career is dependent upon other elements.

It is true that men with character handicaps have won professional success. This is due, almost without exception, to unusual ability along certain lines. Such men do not represent the average; no generalization can apply to a genius.

What is true of the engineering profession must be true of other professions, and also of business. We believe it was Mr. J. P. Morgan who said in an interview, that in extending credit and in selecting men for responsible positions, character was the first consideration; that investment in ability without character was never safe.

Homilies on character seldom produce a lasting impression; the treatment of the subject is usually theoretical, and the homilies are delivered by those who have not engaged in the rough-and-tumble competition of life. But when six thousand men who have won distinction in a highly competitive profession place character at the head of the elements essential to success, its supreme practical value cannot be doubted. Its social and moral value goes without saying.—*The Wire Message.*

Herbert's Book on Telegraphy

The Fourth Edition of Herbert's "Telegraphy" was placed on the market in December. The price of this enlarged book of 1,020 pages is $6.50 per copy. This work is a detailed exposition of the telegraph system of the British Government, and has been thoroughly revised as well as enlarged. It not only describes the English telegraph systems, but other systems which are of direct interest to American practice.

The chapter on Secondary Cells or Storage Batteries has been extended and brought up to date. A description of the Kleinschmidt Perforator is also found in this book.

Appendix C on the Gulstad Relay has been rewritten in view of the adoption of this relay on so many long and difficult circuits.

In the Addendum following the Appendix there is an elementary account of the amplifying wave.

The use of small currents to enable telegraph and telephone circuits to be worked in the same cable has far-reaching consequence in the English telegraph practice, and it is fully covered.

A chapter is also devoted to the Vibroplex. Experiments are being made to ascertain whether its adoption lessens the strain on the telegrapher, reduces the liability to "cramp," and increases the output of work.

Those desiring copies of this valuable book should address and make remittances to John B. Taltavall, Publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

THE FELLOW who isn't fired with enthusiasm is apt to be fired.

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Hearts Content Cable Station

By H. W. Morehouse

During the past two years, extensive improvements have been made at the Western Union Cable Station in Hearts Content, Newfoundland. This station is the western terminus of four of the company's Atlantic cables.

A women's staff house has been fitted up, two new double houses for employees have been erected, and an L-shaped one-story brick addition built adjoining the old station building. The operating room, which measures 75 feet by 33 feet, occupies the entire front of the new building, while the rear wing contains a double walled artificial line room, test, terminal and magnifier rooms.

The old part of the station building has been remodeled so as to provide better toilet, rest and locker rooms for both male and female staff. The superintendent's office, mechanician's shop, school and file rooms are also located in the old building.

The rear wing of the old building houses the power plant, which has been enlarged to meet the requirements of the new office. Storage batteries, supplying current to the various circuits, are charged from motor generator sets operated on the local commercial a. c. supply.

For emergency use there is a four cylinder gasoline-kerosene engine direct connected to a 10 K.W. generator.

The new operating room is well lighted and ventilated by high windows on two sides. Artificial lighting is furnished by semi-indirect fixtures of the latest type.

The operating tables are placed so that windows are at the ends of the tables, and no operator faces the light. In assigning table positions east bound traffic has been kept at one end of the room and west bound at the other, with the routing desk near the center.

An innovation in cable service is the use of belt conveyors for carrying messages from the receiving positions to the routing desk. Each table is equipped with a centrally located belt running toward the pick-up belt along the wall end of the tables. There are separate pick-up belts for east bound and west bound traffic, so that the messages are kept separated and are delivered to opposite ends of the routing table.

This table is provided with a special two-way belt conveyor for transfer of messages from the several working positions to either end of the table, where route clerks sort to pigeonholes for distribution by office messengers to the sending positions.

The cable operating tables are designed for working two cables on each, the perforators and auto transmitters being on one side, and the recorders on the other.

Near the center of the room is located the relay table, which is arranged to accommodate three double cable relays and associated apparatus.

The cable panel, land line switchboard and power distribution panel are located at one end of the operating room. The cable panel is designed to accommodate ten cable circuits. Changes in connections are made by rearrangement of copper straps on the face of the panel.

As previously mentioned, the walls of the artificial line room are double with air space between. As an additional means of protecting the artificial lines from temperature changes and dampness, they are stacked in sections in refrigerator type cabinets.

In the terminal room the testing equipment is placed near the terminal cabinet, where the cables enter the building. By removing copper straps from the terminal posts tests may be made on the cable conductors or earth leads entirely disconnected from the station equipment.

The test set is so wired that tests ordinarily used may be made by inserting plugs at proper points, thus doing away with miscellaneous loose leads around the table.

Incoming cable signals are amplified by Heurtley magnifiers installed at the other end of the terminal room. The adjusting instruments for the magnifiers are mounted in raised cabinets above the tables.

All wiring of cable circuits has been done with lead-covered duplex wire run in ducts under the floor. Over 23,000 feet of this wire was required for the installation.

Power wiring and cable circuits have been placed in separate ducts and conduits so as to reduce interference between circuits.

Jones' Book of Diagrams

The text-book of the telegraph profession, "Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, is by far the most popular electrical book on the market. This standard work has been carefully revised and brought up to date, and includes full descriptions of the newest apparatus adopted by the Western Union and the Postal Telegraph Companies. It presents the finest study of the telegraph ever published; it explains clearly the equipment of a modern telegraph office, and is a text-book that no student, operator, engineer, or official can afford to be without; 64 chapters, 488 pages, 250 illustrations. A new edition issued in April, 1918, includes an appendix of 24 pages, containing 16 illustrations, covering the new Western Union Multiplex System. Price $2.50 per copy. Address and make remittances to Telegraph and Telephone Age, 253 Broadway, New York.

Radio Buzzer Sets

Telegraph and Telephone Age, 253 Broadway, New York, can supply buzzer sets for learning the continental alphabet by means of buzzer signals, the same as heard in telephone receivers used in regular radio working. These sets are equipped with key, high-tone buzzer, and flash lamp signal, complete on one base. The price is $4.00 for the set.

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CONCERNING THE PREPAYMENT OF CABLE MESSAGES

Companies Acting Under International Rules, Will Accept Deposits, But They Cannot Compel the Sending of a Reply—Sender Must Take the Risk

The Merchants' Association of New York, recently addressed a letter of inquiry to the six cable and overseas wireless companies in New York City asking about prepayment of replies to outgoing cable messages.

This letter, which was signed for the Association by S. C. Mead, secretary, read as follows:

"The statement has been made to The Merchants' Association of New York that it is the uniform practice of cable companies in New York not to permit the sender of a message from New York City to a foreign country to provide for a paid reply, either with or without specifying the number of words to be included in the reply message.

"This letter is to inquire as to what facilities your company provides for the sender of a message to a foreign country to arrange for a reply to his message, either prepaid, or chargeable to the account of the sender."

Replies were received from the traffic managers of all the companies, but the reply made by George Clapperton, traffic manager of the Commercial Cable Company, gave a more satisfactory explanation than the others.

MR. CLAPPERTON'S REPLY

Mr. Clapperton's letter reads as follows:

"We refer to your letter of November 24th relating that the statement has been made to The Merchants' Association of New York that it is the uniform practice of cable companies in New York not to permit the sender of a message from New York City to a foreign country to provide for a paid reply.

"The statement is not true of the Commercial Cable Company. We do not think it is true of any cable company.

"The sender of a message may prepay a reply by writing before the addressee's name the words 'Reply Paid x Words.' Example: Reply Paid 30 words Julius Bramberger, Bremen.

"Senders are discouraged from sending prepaid reply messages to countries suffering from political unrest for the reason that they may fail to get a reply and be unable to obtain the return of the prepayment.

"The announcement 'Reply paid 30 words,' or in the shorter term permitted, 'RP 30,' is notice to the delivery office that the charges for a reply of 30 words have been deposited by the sender, and are standing to the credit of the delivery office. The charges collected are passed on in the monthly accounts until they finally reach the delivery office.

WHERE DISTURBED CONDITIONS EXIST

"In countries where there is political disturbance, the telegraph administrations of those countries give notice that messages are only accepted at the sender's risk, and that no inquiries can be answered. This is provided for in the International Convention and Service Regulations.

"Difficulties with senders always arise when there is a catastrophe, such as occurred in Italy; a state of war, as in Poland, or general disorganization, as in Germany following the armistice. As soon as the restrictions were removed, persons having friends in those countries, not knowing whether they were alive or dead, or whether they were at their pre-war residences, cabled freely and prepaid replies. Receiving no reply, they demanded the return of the pre-payment. Possibly in the interim they received word by mail of the well-being of their friends, and that intensified their dissatisfaction and demand for the return of the pre-payment.

COMPANIES AND REPLIES

"Senders persist in their own conviction that it is the business of the cable company to go and get the reply, or refund the money. The difficulty the cable companies find is in making senders of prepaid reply messages understand that as soon as the outgoing message, having the indication Reply Paid before the name, leaves the company's lines, the company has lost control of the prepayment which now belongs to the country of destination; and if no reply be received, the prepayment cannot be recovered unless certain formalities have been attended to by the addressee. These formalities are generally neglected from lack of interest or lack of understanding on the part of the addressees. One of the conditions is that the voucher delivered to the addressee if not used, must be returned to the issuing office within three months. Vouchers which are orders on the foreign telegraph office to perform the prepaid service turn up in this country six months or a year after they are outlawed. The rules are printed on every voucher. The rules governing prepaid replies are not local rules or companies' rules: they are international rules, agreed on at the periodical conferences of the government owning telegraph administrations of the world. They cannot be changed by any company.

"Senders will find no difficulty in sending prepaid reply messages to countries where there is no disorder, nor will any Commercial Cable office decline to accept a prepaid message if the sender insist it be accepted at his risk."

"Be square" and "Live clean" were the dominating thoughts transmitted to thirty Western Union messengers in the recreation room at the Milwaukee main office by Frank R. Sherwood on the night of November 8. Mr. Sherwood, who is touring the State in the interest of the State Board of Health's "Keeping fit" campaign, had a message for the boys that held their close attention throughout the 45-minute discourse and he was loudly applauded by the youthful audience when he finished.

Similar meetings will be held semi-monthly throughout the Winter.

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Quotation Relative to Radio Laws

With the extension of the use of radio communication, the following with reference to secrecy and divulgence of radio communications from an act to regulate radio communication, approved August 13, 1912 (Public No. 264), is of interest:

SECRECY OF MESSAGES

Nineteenth—No person or persons engaged in or having knowledge of the operation of any station or stations, shall divulge or publish the contents of any messages transmitted or received by such station, except to the person or persons to whom the same may be directed, or their authorized agent, or to another station employed to forward such message to its destination, unless legally required so to do by the court of competent jurisdiction or other competent authority. Any person guilty of divulging or publishing any message, except as herein provided, shall, on conviction thereof, be punished by a fine of not more than two hundred and fifty dollars or imprisonment for a period of not exceeding three months, or both fine and imprisonment, in the discretion of the court.

PENALTIES

For violation of any of these regulations, subject to which a license under sections one and two of this Act may be issued, the owner of the apparatus shall be liable to a penalty of one hundred dollars, which may be reduced or remitted by the Secretary of Commerce, and for repeated violations of any of such regulations, the license may be revoked.

For violation of any of these regulations, except as provided in regulation nineteenth, subject to which a license under section three of this Act may be issued, the operator shall be subject to a penalty of twenty-five dollars, which may be reduced or remitted by the Secretary of Commerce, and for repeated violations of any such regulations, the license shall be suspended or revoked.

Further, in the regulations made by the Department of Commerce, Bureau of Navigation, pursuant to acts of Congress, the following is quoted:

203. Operators of receiving stations do not require licenses, but all persons are required to maintain secrecy in regard to messages, as provided in the act of August 13, 1912, nineteenth regulation of section 4.

W. H. BLACK at the opening meeting of the Telephone Pioneers of America at Montreal last September in his opening address told this story: A titled Englishman traveling in this country boasted that "About two hundred years ago a queen tapped one of her ancestors on the head with a sword and made him a Lord." "That's nothing," said the Yankee; "about two hundred years ago an Indian tapped one of my ancestors on the head with a tomahawk and made him an angel."

Reconstruction of Telegraph and Telephone Systems in Belgium

In spite of the utter chaos existing at armistice and the setback in reconstruction due to severe snowstorms of last January, the Belgian Telephone and Telegraph Department states that up to July 1, 1920, 282 central telephone offices out of 283 had been re-established. Of telephone subscribers in 1914, 80 per cent. have been refound. It is curious to note that at Antwerp, Malines, and Turnhout there are now more subscribers than before the war. In Brussels there are 14,700 out of a pre-war 18,400, and at Liege about 4,000 out of a previous 5,000.

Reconstruction, it is said, would have been more rapid but for the complete removal or destruction of all copper wire and other material by the Germans. On the eastern lines not a single wire was left. In Brussels, the large and spacious installations were hacked. Some of the commutators have been found in Berlin, and engineers sent to recover them. The material taken from Brussels alone is valued at more than 2,000,000 francs, and that from Belgium as a whole at more than 70,000,000 francs (pre-war basis). In Ostend and Ghent, telephone and telegraph equipment was broken with hatchets and sulphuric acid thrown over everything that could not be otherwise destroyed.

Do Not Hesitate to Ask Questions

There are in every telegraph and telephone office young men, students of their profession, who do not like to ask for information, help, or hints, or suggestions, for fear their lack of knowledge will prove a detriment in their efforts to advance. This may be the case in some offices, but it is not true in a majority of offices where we know those in charge are only too willing to assist students of electrivity to make themselves more useful. Students should, therefore, not hesitate to ask questions until they obtain all the knowledge they require to make smooth their path in the pursuit of electrical knowledge.

Salvaged Old Submarine Cable

Cable which had been down twenty years in San Francisco bay was salvaged by the Pacific Telephone & Telegraph Company. There was need for a piece of seven-pair submarine Okonite cable, and as it was impossible to procure any, a submarine cable 11,000 feet long was laid between Yerba Buena Island and the Oakland fill, in San Francisco bay, and which was out of service, was pulled up. Only 2,200 feet was suitable for use. In view of the age of the cable, it was in a remarkably good state of preservation.

The reason why telegraphers prefer to receive messages from Roanoke, Va., is because there is always an O. K. in Roanoke.

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Jean Gegou Becomes Manager of the French Cable Company

Jean Gegou, the new manager of the French Telegraph Cable Company in New York, has had a long and varied career in the cable business. He was born in Algiers, of French parentage, on December 18th, 1868, and joined the French Government Telegraph Service as a telegrapher in 1887. Four years later he was sent to Senegal, West Africa, where he passed ten years in the cable and telegraph service. He was an expert on many instruments, including the Morse, Mirror, Wheatstone, Hughes, Baudot and Siphon Recorder.

JEAN GEGOU

In 1901 he transferred his energies to the Western Hemisphere, and we find him doing the duties of an electrical cable engineer on board the French cable ship *Pouyer Quertier,* with which ship he served a campaign of two years, during which he visited Para, Paramaribo, Cayenne, Trinidad, St. Lucie, Guadeloupe, Martinique, Curacao, Caracas, La Guaira, Coro, Porto Cabello, Carupano and many other interesting places.

On May 8th, 1902, he was on board the *Pouyer Quertier* which was lying about eight miles off St. Pierre, Martinique, when the terrible eruption of Mont Pelee occurred, which killed all the inhabitants of that town. No one was hurt on the "P. Q." and on the morning of the 9th of May they went into St. Pierre under a constant rain of stones and cinders, smoke and gas and fire still being vomited from the volcano and rescued a number of the inhabitants from the vicinity, taking in all 2000 people during the three days following the eruption, and carrying them to Fort de France, Martinique. In recognition of his services on this occasion, the French Government made Mr. Gegou an "Officier d'Academie."

After his West Indian campaign, Mr. Gegou was sent to St. Pierre, Miquelon, an island off the coast of Newfoundland, where he remained from 1903 to 1913 as manager of the French Telegraph Cable Company's station. In 1914 he came to New York as assistant manager with E. C. Sweeney and remained here. He has now been appointed manager at New York from January 1st, 1921, on Mr. Sweeney's retirement.

E. C. Sweeney, Manager of the French Cable Company, Retires

Edward Charles Sweeney, who for the past ten years has been the New York manager of the French Telegraph Cable Company, has decided to accept his pension and retire from the service of that company to enjoy a well-earned rest, his official retirement dating from December 31st, 1920.

Mr. Sweeney, who has been forty-two years in the service of the French company, was born in Liverpool, England, April 13th, 1857, and has been one of the best known figures in the Atlantic Cable business for the past two decades. He commenced his telegraph career with the London and North Western Railway at Lime Street Station, Liverpool, in 1870, later he joined the British post office telegraphs where, in addition to being expert telegrapher on various instruments, such as the Single Needle, A. B. C. Morse Sounder, etc., the telegraphers also had to sort letters, sell stamps and do other post office work. Mr. Sweeney afterwards graduated into the Direct United States Cable Company's service, being with them in England and at Torbay, Nova Scotia. When the French Cable Company commenced business in 1879 Mr. Sweeney was the first operator appointed by them and he has remained with them ever since. He was for twenty years clerk in charge of the cable station at St. Pierre, Miquelon, then came to New York as superintendent under Mr. Lurienne, and when the latter succumbed to a serious illness, Mr. Sweeney was appointed as manager in April, 1911.

E. C. SWEENEY

In addition to being a first class siphon recorder operator, Mr. Sweeney is one of the few remaining experts in the mirror, or reflecting galvanometer, system of working cables, which system was super-

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seded by the siphon recorder in 1884. He was, and still is, an exceptionally fine penman even among cable men, and in the old days a large majority of cable operators were noted as caligraphists. Mr. Sweeney speaks French fluently, which is rather unusual for an Englishman, as most of our doughboys who went to France can testify.

Mr. Sweeney's ruddy and jovial countenance will be much missed in cable and telegraph circles, and many good wishes go with him in his retirement.

Work

By MERCER P. MOSELEY, *Vice-President, American Exchange National Bank, New York*

Everybody is asking what is the matter, whether the world is bent on a chaotic jaunt that will land us in inscrutable darkness, or whether somehow, somewhere, sometime, we are going to grab hold of a ready-made panacea that will put us back on a street that reads "Pleasure" and has no objectionable sign-posts labeled "Work."

The answer is that we are not going to be projected into the abysmal depths of any economic chasm with ends sealed up and no rope-ladders. Anyone who thinks can mighty easily figure out the real and present reason for our national stomach-ache.

The answer is a world-wide determination to eat ambrosia and to sport silk shirts without working for them. It cannot be done.

Production is the measure of all material progress. You cannot enjoy a thing before it is produced. Producing a thing requires work. You have got to do a little sweating in the face before you can eat your apple pie, and somebody's physical work is necessary before my lady can don an ermine opera cloak or nonchalantly exhibit a brand of silk stockings that are retailing from $5 to $100 per pair.

Let us just stop a moment and agree that Brownsville, Texas, is the whole world, i. e., that all the people in the world are living in Brownsville. Let us agree that the population of the world consists of one hundred men. It then follows that the maximum progress of the world can be measured by the producing power of these one hundred men. Now, let us say that five of these men elect that for one reason or another they will not work. It therefore follows that progress has been arrested to the extent of five per cent. Follow the illustration further and say that fifty of these men decide that they will not work, and you will have a depreciation of fifty per cent. from your maximum production.

Or again, let us say that the entire one hundred men meet and agree that instead of working ten hours a day they will only work five hours a day. The obvious result of this would be that their production would be cut in half. Now, if this community of one hundred men possessed, as it would, all of the qualifications for producing, by working, the things that would make their lives not only comfortable, but which would in addition surround them with all of the luxuries they could possibly require, and this community decided that while it wanted all of these good things, it was not willing to work for them, the answer would be plain, namely, that the only thing that stood between them and a full enjoyment of their heart's desires was—work.

There isn't a thing the matter with the machinery of production. The only thing that is the matter is that for some reason, principally idleness and selfishness, we have apparently made up our foolish little minds that we can take a head-on dive into the pools of pleasure and at the same time totally disregard the Biblical injunction "In the sweat of thy face shalt thou eat thy bread." If you don't believe this statement, just generate enough energy to get up early enough in the morning in the great City of New York, or anywhere else, and gaze around the streets and see what is going on. The Catacombs of the ancient world have nothing on some of our principal thoroughfares at 7 o'clock in the morning. They are equally free from active life.

What we need is a thorough awakening on the part of both men and women to a realization of the fact that God Almighty has put us in a world filled with opportunities—in a land where the raw material and the milk and honey of our environment of unspeakable excellence is ours for the taking, if we will only do the thing that He has commanded us to do, namely, work. What we need is to dethrone the image of "Idleness" and in its stead to place upon our national pedestal that of "Work," reconsecrating ourselves to the faith of our forefathers, who, through sweat, grime and whatever was needed, built a principle into American life which we are apparently bound on destroying.

We need to get back to the practice of the simple faith that we find in the religious expressions of those who bore the brunt of our early development.

Above all and beyond all, we need to get back to constant, honest and unremitting work, than which there is no greater privilege or more glorious blessing.

Silver vs. Platinum

An electrical concern made a mistake sometime ago in placing silver points instead of platinum points in some telegraph keys. The silver points were intended for learners' instruments, the metal being too soft for use in the ordinary telegraph apparatus that is subjected to hard usage. When the mistake was discovered it was found that in appearance the silver points could not be distinguished from the platinum points, as the color was precisely the same. The manufacturer then determined to place the keys in close proximity to sulphur, which tarnished the silver points and which had no effect on the platinum points.

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Western Union Reopens Suit Against Louisville & Nashville

Within two hours after a decision of the Supreme Court became known in Louisville on December 6, 1920, in which it upheld the position of the Louisville and Nashville Railroad Company in its eight years' litigation with the Western Union Telegraph Company and refused to restrain the railroad from removing the Western Union's poles from the railway right of way, suit embracing allegations similar to those contained in the original action was filed in the Jefferson Circuit Court by the Western Union against the Louisville and Nashville Railroad Company.

The petition apparently reopens a case which had been waging in the courts for eight years and which it appeared the Supreme Court had settled two hours prior to the new suit. It was expained, however, that the action of the Supreme Court in refusing to issue a writ of certiorari, or, to review the finding of the United States Circuit Court of Appeals, did not stop further proceedings, as the Appellate Court's finding was merely interlocutory and not final.

The telegraph company avers that its property along the railroad right-of-way is worth $443,300, but if it is removed, its value will be "scarcely appreciable, and practically junk."

The refusal of the Supreme Court to review means that the temporary injunction secured by the telegraph company in the United States Court will be dissolved upon arrival of the mandate from the highest tribunal. It is for this reason that the telegraph company lost no time in filing the suit in the State court here for an injunction, that company insisting that the matter is peculiarly one of State law, regardless of a contrary holding by the United States Circuit Court of Appeals.

The telegraph-railroad litigation has been constantly in the courts since 1912, the litigation originally growing out of the rescinding in the railroad of a contract made on June 18, 1884, by which the telegraph company was given the right to construct its wire lines along the right of way of the railroad company. The contract, as is stated in the petition filed on December 6th, was to cover a period of twenty-five years, and provided that it continue in force after that period until ended by either of the parties to it after one year's notice. Reciprocal service was provided for. In July, 1912, the telegraph company instituted proceedings for condemnation against the railroad to acquire an easement over the right of way of the Louisville and Nashville in Kentucky. On August 17, 1912, the railroad notified the telegraph company to begin on September 1, of that year, to remove its poles, etc., from the right of way.

The railroad company was then enjoined. The condemnation proceedings instituted by the telegraph company went through two trials, and in 1916 a judgment was secured in the District Court. In the same year the Kentucky Legislature passed an act which, the Louisville and Nashville claimed, terminated the telegraph company's right to condemn. The decision in the condemnation proceedings, tried before Judge Walter Evans at Louisville, was reversed. The Louisville and Nashville requested Judge Evans to dissolve the telegraph company's injunction, which was in force in six States, on the ground that that company had no right to condemn, and that there was no occasion to protect its lines and poles. Judge Evans overruled the motion, holding that the legislative act of 1916 was unconstitutional.

The Circuit Court of Appeals, when the case came before it, held that the legislative act was constitutional, and put an end to the telegraph company's right to condemn insofar as Kentucky was concerned.

Electrical Aid Society of Philadelphia

The thirty-third annual meeting of the Electrical Aid Society will be held on Wednesday evening, January 19th, 1921, at 8 p. m., at the Grand Fraternity Hall, 1626 Arch Street, Philadelphia. There will be big eats, good music and dancing. John A. Chapman is president, and W. E. Vanarsdall, secretary of the Society.

Dr. J. T. Morehouse Dies—Martyr to X-Ray

Dr. James Thomasson Morehouse, one of the pioneers in X-ray treatment, died on December 20, 1920, in the New York Hospital, a martyr to his work. Dr. Morehouse had often voiced the expectation that X-ray burns eventually would cause his death. He had undergone two major operations on his left side, which had become affected by exposure to the ray, the last operation having been performed October 15.

For thirty years X-ray research has been Dr. Morehouse's hobby and he devoted much of his time to that work. His left hand bore many scars from the burns received, and it became necessary to amputate successively the first and second fingers in order to stop the spread of the trouble.

In 1905 Dr. Morehouse suffered the first burn on his left hand and during the following years he was scarred many times. In the spring of 1918 the first finger amputation was found necessary and the second in September of 1919.

In June, 1920, Dr. Morehouse underwent the first operation in the New York Hospital.

He was an associate of Thomas A. Edison and others.

Single Line Repeater

The single line telegraph repeater manufactured by the Jester-Cooper Company, Houston, Tex., is being used successfully on several large railroad systems and in commercial telegraph service.

The management of this repeater is as simple as that of an ordinary single relay and sounder set, with which all telegraph operators are familiar. No local battery is required in its operation.

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Duplex Wireless Telephony and Selective Reception

The first part of a paper which was read by E. F. W. Alexanderson before the Institute of Radio Engineers, at New York recently, deals with duplex wireless telephony, and the second part with a highly selective "barrage" receiver. In the duplex method described, the speaker can hear the called party without manipulating a switch to transfer from sending to receiving. For this to be possible it is necessary to neutralize the intensity of the transmitted signal, and the first method that yielded practical results was the use of separate sending and receiving antennae, located sufficiently far apart that the selectivity of ordinary receiving instruments could differentiate between the wave lengths of the receiving and sending stations. The subscribers and sending stations are connected like two ordinary subscribers on a central exchange, with the only difference that a transformer with its primary winding connected across the line from the receiving station is, by its secondary, permanently introduced in series with the line to the sending station. A telephone current originating in the receiving station is thus transformed into a current flowing in the closed circuit between the subscriber's instrument and the instrument in the sending station. A telephone current originating in the subscriber's instrument will follow exactly the same path. Both these currents will, therefore, be transmitted by the sending station, and both sides of the conversation may, in fact, be heard by a third party tuning his apparatus to the two-wave lengths. This system is suitable for inter-connection with wire telephone exchanges.

The most practical method consists in mounting the sending and receiving antennae on the same masts, and preventing mutual interference between them by inductive or capacitative neutralization. In the former method, an inductive coupling is provided between the two aerials by a transformer connected in such a manner that it creates in the receiving antenna a potential opposite in phase to the potential directly induced by the sending antenna.

The bridge receiving set connections are analogous to a Wheatstone bridge. By adjusting the condensers in the bridge arms extremely perfect neutralization is possible of the effect of one antennae on the other. Local stray currents may be effectively neutralized by intercepting them on a wire loop in the neighborhood of the receiving set and impressing the potential so generated on a little coil mounted with an adjustable coupling close to the secondary loading coil of the receiving set.

The "barrage receiver" is a highly directional combination of aperiodic antennae with unilateral directional characteristics. When two antennaes are used, the phase difference of the received currents depends on the direction of the incoming signals. By phase-shifting devices and differential coupling to a common receiver the signals from any given direction can be balanced out. Each antennae is connected to earth through an intensity coupler, the secondary of which is connected to the primary of a phase adjuster, built in the form of an induction regulator. The primary current is connected in split phase so as to produce a rotating field that cuts the secondary windings. The neutralization of the signals from any particular direction is effected by adjustment of the intensity couplers and phase adjusters.

An experimental set was erected three miles from the New Brunswick station, the wave length of which is 13,600 metres. Nevertheless, signals from Carnarvon, Wales, with 14,200 meters wave length, were received, the signals from the New Brunswick station being entirely eliminated, notwithstanding their intensity and small difference in wave length. By using a double set of phase adjusters, signals from two stations in different directions may be neutralized simultaneously.

Germans Multiply Wireless

According to a press dispatch, the Germans are rapidly developing wireless for domestic telegraphic traffic and for overland use with adjacent countries. Announcement is made that in order to relieve the overburdened land telegraph lines, regular radio communication has been opened between Berlin and Koenigsberg.

A speed of sixty words per minute in automatic wireless telegraphy is made between the two named stations by means of automatic sending and receiving.

The dissemination of news to the larger German newspapers is the next move. At certain hours the Berlin station will transmit news reports which receiving stations in the different cities will simultaneously copy for the press. The inauguration of this news transmission has already been tried out and is said to work well.

"The Night Operator"

"Telegraphers who enjoyed reading "The Wire Devils" will welcome this new book by Frank L. Packard. The book contains a number of short stories written about the alluring game of railroading; the first story, "The Night Operator," is also the title of the book.

In "The Night Operator" you will follow with spell-bound interest a panorama of rushing mountain rivers and dangerous curves, of brave men responsible for the safety of others, who meet their obligation with high hearts and abounding courage.

And when the book is read you will recall with delight "Toodles," the spunky little night operator; "Royal Carlton," the big superintendent"; "Regan," the purposeful master mechanic, and "Timmy O'Toole," the valorous Irishman, and say to yourself, "Packard has done it again; written another breathless adventure story; I hope he goes on writing them."

The price of the book is $1.75 net. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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EDITORIAL COMMENT

We acknowledge with thanks the receipt of a large number of Christmas and New Year's greetings from friends located in all sections of the world. These tokens of good-will and cheer were interesting and fully appreciated.

Cable Conference Reopened

The International Communications Conference, which adjourned just before the holidays, will resume its sessions at Washington, it is thought, in the near future, at the call of Norman H. Davis, acting secretary of state, who also is chairman of the conference. Disposition of the former German cables, left undecided when the conference adjourned due to the bitter opposition of France and Japan to certain features of the settlement, will be attempted.

The coming sessions of the conference will be attended by the ambassadors of Great Britain, France and Japan and the charge d'affaires of the Italian embassy.

It is understood that instructions have been received in Washington by several of the diplomatic representatives in regard to disputed points in the previous conference and that there is a prospect now that some agreement may be reached for a division of the cables which were formerly controlled by the Germans. Unless an agreement is reached prior to the fifteenth of next February the conference must, according to the existing agreement, devise a modus vivendi for the operation of the cables to the existing agreement.

Technical members of the various delegations are at home now and the reports which they have made to their governments are expected to play a large part in the course of future discussions.

The Western Telegraph Company's Annual Report

At the eighty-seventh ordinary general meeting of the Western Telegraph Company, Ltd., held in London, England, December 15th, 1920, Sir John Denison-Pender, chairman of the company, made the following reference in his report to the stockholders to the Western Union cable from the Barbados to Miami, Florida:

"Our new cable from North Brazil to the Island of Barbados was laid in September last. A short time before, an expedition started to lay the connecting cable, owned by our American friends, the Western Union Cable Company, from Barbados to Florida, there to join up with the vast land line system of the latter company in the United States. At almost the last moment, however, we were all surprised to learn that the American Government refused to permit the Western Union Company to land its cable on American soil, the objection being that the Western Union intended working in conjunction with us, a British company holding exclusive rights from the Government of Brazil for submarine cable communication. I would impress upon you the fact that we hold no exclusive privileges for international cables, and in evidence of this an American cable company owns cables from Rio de Janeiro and Santos to Uruguay and Argentine, also a French enterprise has a cable from Pernambuco to West Africa and thence to France; another French company owns a cable from North Brazil to the United States of North America. Before the war the Germans also owned a cable from Pernambuco to the West African Coast and on to Germany. The rights we hold are for cables connecting Brazilian ports, in which Brazil herself is alone interested. A regrettable feature of this unfortunate incident is to us, a British company, the active opposition of the British Minister in Washington, who went even further than the United States Government, and issued instructions to the commander of the British ship chartered by the Western Union Company to lay this cable, not to proceed with the work; however, these instructions were not supported by our Foreign Office, and the cable was laid, with the end buoyed, outside the United States territorial waters, at a position agreed upon with the United States Government. It is hoped that communication will shortly be made, these two sections joined up, and a new service of traffic then opened between Brazil and the United States, but it may not be by the route originally contemplated."

Cuba Prevents Landing of Barbados Cable

On instructions of the Cuban president, two members of the Havana Port police force have been sent to Cojimer, a small village on the coast, with orders to prevent the landing of the Western Union Telegraph Company's Barbados cable at that point. Just why this action was taken has not been made clear.

It was understood that the Cuban government had granted all the permits necessary for the connecting of the cable on Cuban soil, and the company had been at work, preparing the land end at Cojimer.

The clash with the United States government was over the alleged monopoly of South American cables by the British, which this cable would extend, it was argued, by agreement with a British

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company. After failure to find a landing on the coast for the new cable, the Western Union announced that it would land the cable on Cuban soil and relay messages to that point.

CAPTAIN JAMES ADAMS, commander of the Western Union cable steamer *Lord Kelvin,* stationed at Halifax, N. S., was killed in an automobile accident in that city by being run down by a train on January 1st. Captain Adams, who was born in Scotland fifty-six years ago, was in the service of the Western Union Cable Company since 1890, and in command of the *Lord Kelvin* since 1919. Previous to that time he was commander of the cable steamer *Minia.* Captain Adams rendered valuable service in repairing cables during the World War on the other side of the Atlantic. He is survived by his wife, two daughters and a son.

DR. ALEXANDER MUIRHEAD, aged seventy-two years, founder of the Muirhead and Company, Ltd., and one of the early workers in cable telegraphy, died in London, England, on December 13th. Dr. Muirhead took out many patents relating to telegraph and electrical instruments and apparatus, and was for some years a member of the old firm of Latimer, Clark, Muirhead & Company, Ltd.

A Thought for 1921

We generally associate the New Year with resolutions of various kinds and it would see apropos to suggest a few in keeping with the tendency of the times; namely, the general feeling of unrest of which even the telegraph and the telephone field is not entirely free. We are very largely the creatures of our thoughts. The thoughts of yesterday reflect in our state of being today. Nursing a grievance, real or fancied, gains us nothing, but rather clouds our mental view and renders our footing none too secure in the real problems to be solved.

Mere wishing gets us nowhere unless there is the will to do behind the wish. The writer has talked to numbers of men in the field who complained of low salary ratings, cramped environment and no opportunity for advancement. To them he suggested a thorough self-examination to see if all these conditions were not produced fundamentally by the mind attitude of the man himself. There is no limit to achievement in this or any other profession when proper thinking and lofty aspiration becomes the keynote, backed by intelligent application and study of the work immediately at hand. To do one's work well, always a little better than what is expected, developing initiative and constant analysis of the why and wherefore of every function of our duties are the premier elements of success. All organic being is built up of action and all action is progressive.

To properly progress we must cultivate a mind attitude of continuous and progressive action, never hesitating, never doubtful, but keeping everlastingly at it. This is the secret of men's successes, and none are barred, no matter the environment or restriction. To achieve means action and that also means that we have no time to indulge ourselves in self-pity, or being sensitive to an apparent lack of appreciation and developing thereby a spirit of pessimism.

The motto for 1921 should be the cultivation of a healthful mind attitude and, second, consistent progressive action behind that mind attitude, making one the complementary of the other.

Old Farmer Lawton

George E. Lawton (Old Farmer Lawton), identified with the Western Union Telegraph service at Denver since the middle sixties, and who retired to his farm at Plymouth, Ill., a few years ago, in a recent letter referring to the Morse record made by Thomas A. Edison, says:

"While there are not many telegraphers in these rural villages, it would surprise you how dear in the hearts of the people, including farmers who now use more or less of his valuable and indispensable inventions, is the name of Thomas A. Edison. I firmly believe if he desired, and had the time, that he could be almost unanimously elected President of this great and wonderful country of ours. I don't see why he does not sing a song, or make a speech for our phonographs, so that we all can hear more of our greatest genius."

A plan to help its employees acquire a systematic savings habit has been announced by the Western Electric Company. It will enable the personnel of the big electrical concern to lay aside each week or month a definite amount which they may wish to accumulate for investment or for any other purpose.

Under the new management the employee who wishes to profit by the saving plan will fill out a form designating the amount he desires to put aside each pay day. He will also indicate just what bank he desires to act as depository of his account. The company will then forward to the bank a check at the end of each month covering the amount that has been deducted from the employee's wages. This in turn will be credited to his account.

The banking accounts will at all times be strictly within the employee's personal control.

New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.
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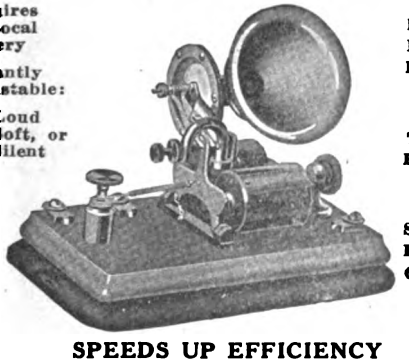
DIAPHRAGM *Telegraph Sounder*

Requires No Local Battery

Instantly Adjustable: Loud Soft, or Silent



Black Enamel Horn

Trouble Proof

Saves Battery Cost

SPEEDS UP EFFICIENCY
REDUCES OPERATING COSTS

An example of the efficiency and money-saving possibilities thru the use of Diaphragm Sounders, was recently brought to light on the Norfolk Southern Railway at Fentress, Va.

Diaphragm Sounders have been in constant use in that office more than six years without a single local interruption—working as good to-day as the day they were installed, and good for many more years of dependable service.

In addition to the improved service—Diaphragm Sounders made it possible for the agent there to save his company 30 zincs, 20 coppers, 6 or 8 battery jars, and about 100 lbs. bluestone.

Equip your relays with Diaphragm Sounders.

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A Money Saver to Railroads

HALL SWITCH & SIGNAL CO.

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MANUFACTURERS OF THE

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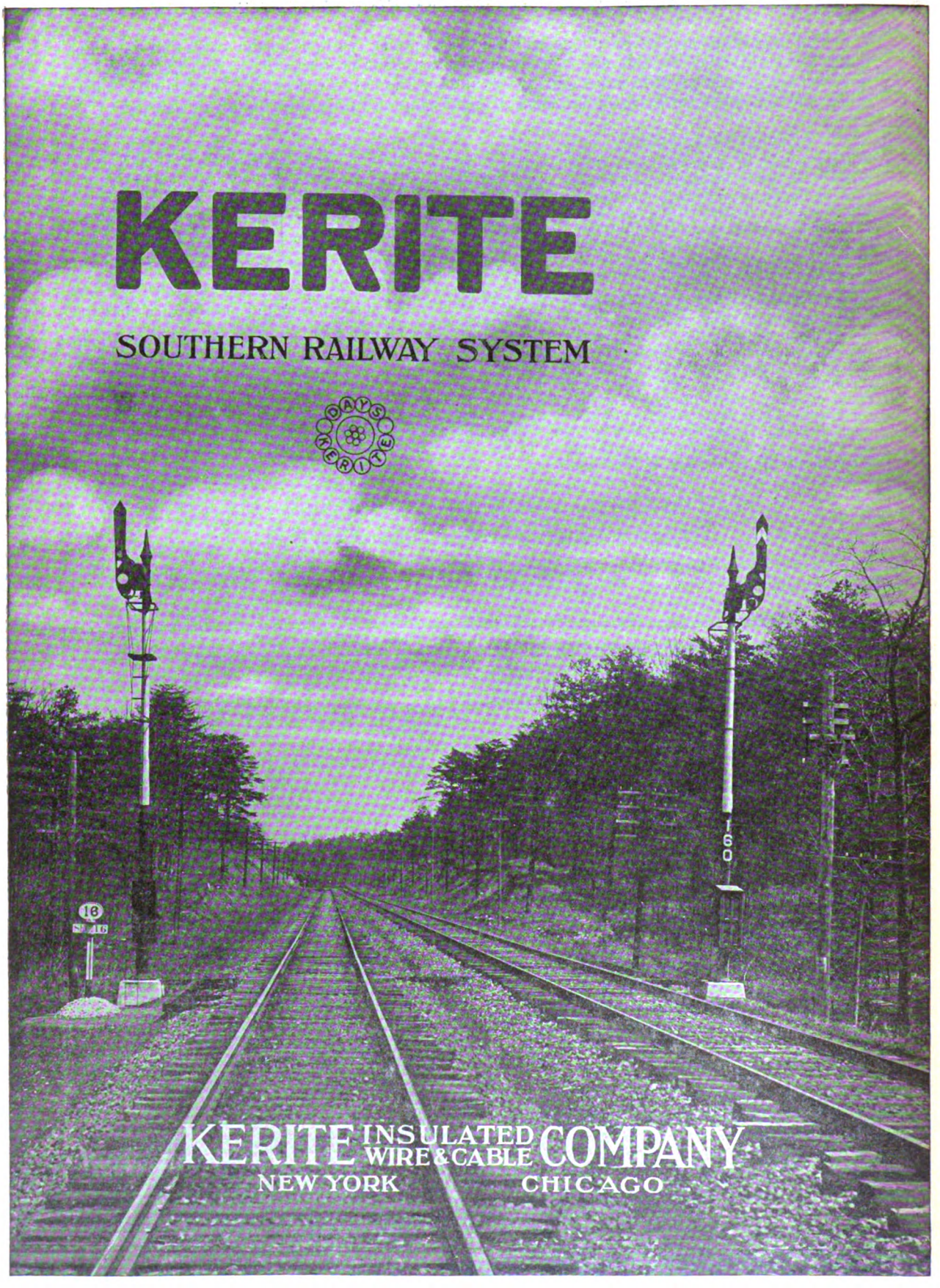

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THE RAILROAD
TELEGRAPH AND TELEPHONE

The American Railway Association and the Metric System

There are many questions, tendencies, conditions and demands which effect the great body of railroad interests in this country. These matters can only be properly considered in the light of their influence on the industry as a whole, and many are, therefore, referred by the individual railroads to the American Railway Association, an association which is representative of the railroads of the country, representing in its membership a mileage of 310,000 miles, which is practically the total mileage of the United States.

In order to fully consider the many subjects which come before this association, its activities are taken care of by the following divisions:

Division 1, operating; Division 2, transportation; Division 3, traffic; Division 4, engineering; Division 5, mechanical; Division 6, purchases and stores; Division 7, freight claims; and Division 8, perishable freight.

Meetings are held by these divisions attended by representatives of the various member roads. This will indicate the scope, importance and influence of the American Railway Association in the railroad world.

The metric propaganda, whose aim it is to force on this country the compulsory use of the metric system while studiously ignoring its permissible use under the existing laws (act of July, 1866), has made strenuous efforts to gain the support of the American Railway Association to its program.

At the meeting of the engineering division of the American Railway Association held in March, 1920, at Chicago resolutions were passed in opposition to the use of the metric system.

Again in June, 1920, similar resolutions were passed at a meeting at Atlantic City by the mechanical division.

Under date of November 24, 1920, a communication has been received from J. E. Fairbanks, general secretary and treasurer of the American Railway Association, from which we quote:

"On the recommendation of the executive committee, the American Railway Association, at its session on the 17th of November, 1920, adopted the following resolution:

"'Resolved, That the American Railway Association hereby ratifies the action taken by the engineering and mechanical divisions in opposition to the adoption of the metric system of weights and measures to the exclusion of the English or American system at present in general use, and desires to express its hearty approval of the effort which is now being conducted to combat the propaganda being waged throughout the country urging the enactment of legislation whereby the metric system would be made the sole standard of weight and measure.'"

DALE D. THOMPSON, general foreman telegraph and telephone, Pittsburgh division, has been appointed to the position of assistant supervisor of telegraph and signals of the same division, with headquarters at Pittsburgh.

G. T. STANTON has been appointed assistant engineer with headquarters in the offices of superintendent telegraph and signals, B. J. Schwendt, Toledo and Ohio Central Railway Company, Columbus, Ohio.

SEVERAL committees of the telegraph and telephone section of the American Railroad Association will meet in Chicago during the week commencing January 17th to submit to the committee of direction for final action the various reports to be acted upon at the March meeting, which will be held in Atlanta, Ga. Sub-Committee "A" expects to make its final report regarding basic rules and pole tables for the construction and maintenance of wooden pole lines for the telegraph and telephone service along railroads based upon the engineering methods, which have been under discussion for the past three years. Sub-Committee "B", overhead wire crossings, will submit a revision of the specifications based upon the new rules used by the Bureau of Standards of the United States Government. Other committees will submit similar important reports which will make the March meeting of the Association one of great interest and value to the railroads.

E. H. COAPMAN, aged fifty-five years, vice-president and general manager of the Southern Railway, Washington, D. C., died January 4th. He began his career as a telegraph operator on the Chicago, Milwaukee and St. Paul Railway in 1880.

There is always a great need in these days for a book that deals with the subjects of printing telegraph systems. "Hughes and Baudot Telegraphs," by Arthur Crotch, price $1.25 per copy, is a work that is brimful of the right kind of information desired by those making the printing telegraphs a study. This book has 84 pages with 41 illustrations. Address orders and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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System and Equipment for Automatically Switching Telegraph Circuits and Operating Positions

Roy E. De Lay and Clyde Smith, two well-known telegraph engineers, sometime ago worked out a clever arrangement for automatically switching telegraph circuits to idle operators. The proposed plan is simply the application of slightly modified auto-manual telephone equipment to handle telegraph traffic.

The supervisor's desk is equipped to permit of close supervision of all circuits and positions. The supervisor is able by means of lamp signals to instantly see the precise condition of all circuits and operators; also to readily identify the operating position connected to a given circuit.

Incoming Traffic—Supervision

Each receiving circuit has a line lamp, "A", placed directly above or below the pigeon-hole box, which contains the number sheet and telegrams for that particular circuit.

Each pigeon-hole box has two lamps, one which is lighted as long as a calling circuit is unanswered. The other lamp is for the purpose of identifying the particular operator then employed on this particular circuit.

The supervisor's key shelf is equipped with a series of lamps and keys. One lamp and two keys for each first class operator's position, and one lamp and one key for each second class operator's position. The lamp in both cases indicates to the supervisor the busy or non-busy condition of the operator. The key forming part of the equipment of a first class operator's position is for the purpose of connecting any idle operator, at the will of the supervisor to any idle circuit for outgoing traffic; also for holding an operator on a circuit in order to clear outgoing traffic.

As the supervisor has knowledge of the condition of all circuits and positions, the connections for outgoing traffic are made from this desk. The act of connecting an idle position to a circuit for outgoing traffic is practically instantaneous, and is wholly under the control and done by the supervisor.

This plan permits any number of circuits to be made common to one or more operating positions. A sufficient number of operating positions are installed for handling the peak load.

It establishes a close co-ordination of lines and operators and provides means for obtaining the maximum efficiency from both.

The incoming load is automatically distributed to the several operators employed.

Circuits may be divided into several groups, according to the speed they are worked or the ability of the operators, i. e., one representing fast circuits on which only first class operators are employed, way circuits, city and private branch offices carrying a light load for second class operators, etc.

In the event a first class operator is idle and all second class operators are busy, a first class operator may be temporarily assigned to receive calls from circuits in the second group at the will of the supervisor.

Incoming Traffic—Operation

A calling circuit will operate its line relay which sets in motion an idle operator's switch. This relay will also cause the line lamp on the pigeon-hole box to light. In the event all operators are busy the line lamp will remain lighted until a connection with an idle operating position is established.

If an operator is idle, the time of connecting the calling circuit to an operator's position will require but a fractional part of a second. When the calling circuit is connected to the operator's position, a position signal lamp will light. This lamp indicates to the operator that a call is on the position awaiting attention, and the local relay may, if need be, adjusted to the line condition. The operator's lamp which is adjacent to the line lamp will also light and indicate to the supervisor the particular operator then engaged on this line. This will permit messages and number sheet for outgoing traffic to be forwarded to the operator without loss of time.

When all traffic is cleared between the two points the called operator releases the calling circuit, which immediately makes the position accessible for another call. During the time the operator is connected to the calling circuit, the operator's individual lamp is lighted on the supervisor's key shelf, which indicates to the supervisor the condition of the position.

When any operator's position picks up a calling line, the supervisor is immediately aware that a particular position is connected to a given line. If the supervisor wishes to notify this position to hold the calling line and await messages and number sheet for this line, he simply presses a key adjacent to the individual operator's lamp, which will light a lamp on the operator's position, indicating that the line is to be held for outgoing traffic.

Telephone Connecting Cuba and the United States

Direct telephone communication between the United States and Cuba is to be provided by the Cuban-American Telephone and Telegraph Company, a permit for the landing of three telephone cables from Havana at Key West, Fla., having been granted the company by the State Department. Laying of the cables is expected to be completed in the spring. They will be approximately 100 miles in length, or longer than any submarine telephone cables yet laid.

Of the three talking circuits to be provided, one will be connected directly with New York, so that the ring of the long-distance operator in Havana will sound in the New York office. A second circuit will pass through the Jacksonville, Fla., central office for service to Western States, and the third will connect with the Key West exchange for calls to and from points in the South.

Construction of the cables, already complete, was said to have presented entirely new engineering problems, due to the depth of the waters in that vicinity.

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Student's Course in Technical Telegraphy

By Louis Casper

Lesson 19

The Wheatstone Bridge at the present time is very generally used by wire chiefs in the localization of crosses, grounds and swings. In previous years the utility of the Wheatstone Bridge for wire testing was limited to the great trunk routes, and such tests were handled only by men of special training in the use of this arrangement.

With the enormous increase of wire mileage carrying important trunk circuits on numerous and divergent routes, it was necessary that a more specific and expeditious method of testing be employed other than station to station tests for locating wire faults. An intensive campaign was then inaugurated by the telegraph companies for the education of wire chiefs throughout the country in the free use of the Wheatstone bridge whenever the opportunity offered.

The result of this has been that out of the total number of wire tests made, upward of 60 per cent. were performed by the Wheatstone Bridge and with gratifying accuracy.

The utilization of the bridge for wire testing purposes would be extremely limited were the arrangement simply restricted to the formula described in Lesson 18, inasmuch as the resistance of most crosses and grounds is a continuously varying one, and any attempt to ascertain the value of such resistance by a purely Wheatstone Bridge formula would bring about results exceedingly doubtful.

For this reason, the method most generally employed is that known as the Varley Loop Test, a diagram of which is shown in Fig. 38.

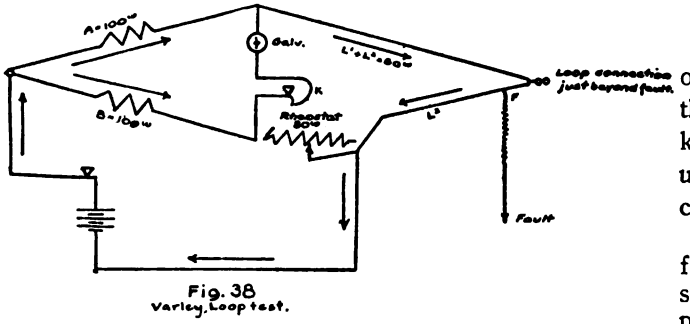

Fig. 38
Varley Loop test.

Varley Loop Test

It will be seen that the essential principle of the Wheatstone Bridge is still utilized, but with it two parallel wires of approximately the same resistance are employed, one of which is the defective wire. These two wires are formed into a loop by being connected at a station just beyond the Fault F. The resistance of this loop is measured by the bridge in the usual manner. The ground or fault F does not interfere with the measurement, since in no other part of the circuit is there another ground to meet that of the fault as shown in Fig. 38.

After this loop resistance has been ascertained and noted, the connections for the Varley test are made as indicated in Fig. 39, which shows one pole of the testing battery connected to the ground.

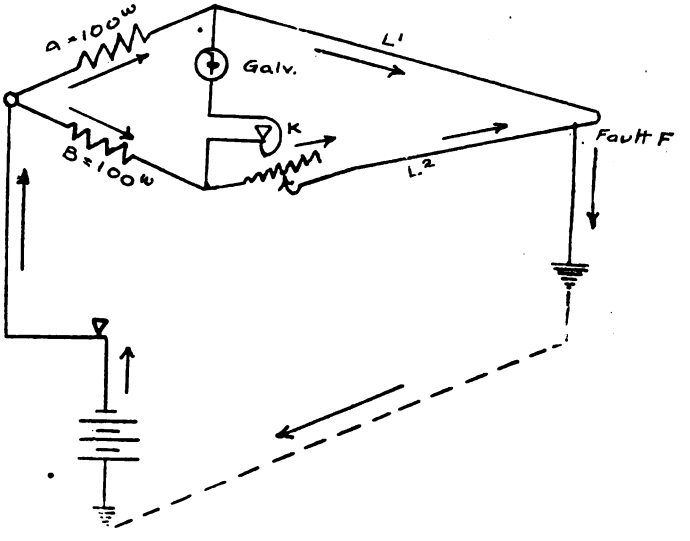

Fig. 39

The rheostat at X is an adjustable resistance in one of the arms of the bridge and is in series with the faulty line wire L_2. By manipulating the bridge key K, the resistance of the rheostat may be varied until the galvanometer needle remains steady, indicating that a balance has been secured.

Reference to Fig. 40 it will be seen from the foregoing arrangement that the fault has been shifted with respect to the bridge connections. A portion of L^3 has been added to L^1, which places the fault in the middle of the loop formed by the rheostat at X and wires L^1 and L^2. By thus changing the connections of the bridge, the fault F becomes the apex for the bridge arms R and X with a portion of L^3 added to the bridge arm R. In order to properly balance the bridge with this rearrangement, it is necessary to add to the resistance in the rheostat an amount equivalent to that which

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has been added to L^1 and subtracted from L^2.

This adjustment of the rheostat and the values obtained therefrom form the basis of all Varley loop calculations, and such tests are entirely independent of the resistance of the fault F.

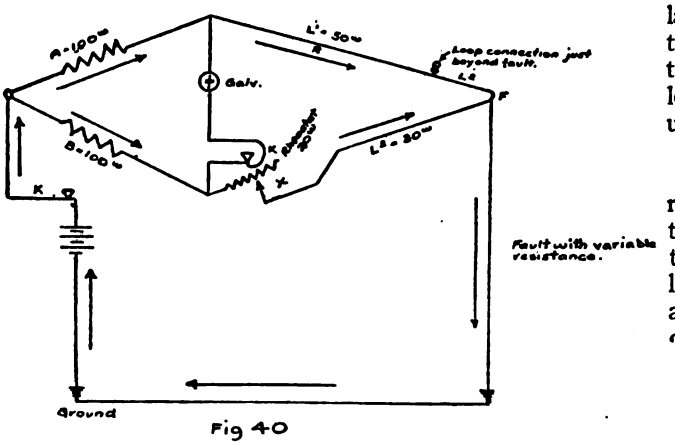

Fig 40

To further illustrate the Varley loop test, let us suppose that the loop measurement (see Fig. 38) is 80 ohms and the Varley measurement (as shown in Fig. 39) is 20 ohms, which is the resistance value inserted in the rheostat necessary to obtain a balance, and, as previously intimated, is equal to the sum of that which was added to L^1 and subtracted from L^2. We will, therefore, subtract 20 ohms from 80 ohms, the loop resistance in this case, which will leave a remainder of 60 ohms. Dividing this by 2 equals 30 ohms, which is the resistance of the wire L^2 from X to the fault F.

From this we obtain the formula:

$$F = \frac{L - V}{2}$$

in which F = Fault
L = Resistance of the loop
V = Varley resistance

Reduced to figures as per example stated:

$\frac{80 - 20}{2} = 30$ ohms res. of the wire from the testing station to the fault.

Should the good wire L^1 forming part of the loop with the defective wire L^2 have so much less resistance than the defective wire that a balance cannot be obtained, notwithstanding that the resistance in the rheostat be reduced to zero, it would then be necessary to transpose wire L^1 and L^2, and the formula for measurement in that case would be:

$$F = \frac{L + V}{2}$$

The resistance of the wire being well known as a matter of record, it is a simple matter to calculate the fault from the testing station. In order to obtain a greater accuracy of measurement a temperature constant is often employed which allows for a variation in the resistance of the lines under different temperature conditions.

This phase of wire testing will be taken up later.

A form of Individual Bridge Test is herewith reproduced, which is used by many wire chiefs throughout the country and which not only serves the purpose of a record, but also as a guide in following out the tests. Upon the face of this form all the calculations can be made, thus forming a complete and ready reference record.

BRIDGE TEST RECORD

DATE Jan 4th/21 - 4.10 PM

NATURE OF TROUBLE-BOARD TEST 212 grded bet Bs + JD

WIRES 212 + 213 LOOPED TO Granger (GR)

RESISTANCE 850 OHMS. LOOP.

VARLEY RESISTANCE 200 OHMS — WIRE

SUBTRACT VARLEY FROM LOOP AND DIVIDE BY TWO (2) 325 W

40 MINUS CABLE RESISTANCE

285 LINE RESISTANCE OPEN WIRE

CALCULATIONS

850
200
2)650
325

4.25) 285.00 (67
2550
3000
2975
25

DIVIDE BY LINE RESISTANCE UNIT 4.25

NOTE: WHEN NECESSARY TO TRANSPOSE WEDGES 1 AND 2 ADD THE VARLEY TO THE LOOP AND DIVIDE BY TWO.

BRIDGE LOCATION 67 MILES

WHERE TROUBLE WAS FOUND 67.2 mile M.P.67 MILES

REMARKS 212 found broken and grounded on guy wire

TEMPERATURE 60° Clear MEASURED BY L. C. Hart

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Radio Corporation of America

THE executive offices are being enlarged by the taking of additional space on the eighteenth floor of the Woolworth Building.

THE plant department has been merged with the engineering department. Alexander E. Reoch, plant engineer, becomes assistant chief engineer.

COLONEL CURTIS H. NANCE of the commercial department was married December 20, 1920, to Miss Jenny M. Sorenson at the Church of the Transfiguration, New York.

ADDITIONAL space has been rented at 326 Broadway, New York, to provide for growth of the maintenance, repairing, inspection and research departments.

EXTENSIVE alterations are in progress at the city telegraph office, 64 Broad Street, New York, which will greatly improve the receiving and delivery departments.

WILLIAM V. MOORE of the Chatham, Mass., high power station, had the misfortune to break his wrist recently while cranking an automobile.

A. E. GERHARDT of the high power station at Marshall, Cal., established the world's record for fast reception of radio signals at the wireless show of the Pacific Coast Radio Convention at San Francisco recently. He copied 49¼ words per minute for four consecutive minutes with but five errors. A Wheatstone transmitter was used, and messages of ten words in length were sent. He also won first place in copying ten letter code messages at a speed of 33 words per minute.

ALFRED THOMAS, JR., chief operator of the Chicago district, has been promoted to be district manager at Chicago.

F. D. HEISER has been appointed assistant superintendent at the high power station at Chatham, Mass.

THIS company's office at Savannah, Ga., has been removed to 14 West Bryan Street.

MISS THALIA N. BROWN, secretary to the president, returned from Bermuda recently per steamer *Fort Victoria*

THE WIRELESS STATION near Bordeaux, France, which was recently turned over to that country by the United States, has a radius of seven thousand miles, and consists of a central transmitting station of eight receiving towers over eight hundred feet high, arranged over an area of one hundred acres.

A HIGH POWER wireless telegraph station is soon to be erected at Fiume, Italy.

Wireless Phone Sends Church Music Broadcast

The musical service at the Calvary Church, Pittsburgh, Pa., was sent out via the experimental radio station of the Westinghouse Electric and Manufacturing Company, at East Pittsburgh, on January 2nd. The hymns were heard several hundred miles distant.

All America Cables

E. H. EARLE has been appointed manager at Fisherman's Point, Cuba.

A. CUNNINGHAM, electrician in New York, has been appointed electrician of the North Atlantic and Mexico Division.

N. J. PERRIMAN has arrived in New York from London, where he had been on furlough. He is in charge of operating and equipment, with headquarters in New York.

A. COOPER has been appointed manager at the Colon, Isthmus of Panama, office.

Heroes of the Telephone Will Get Valor Medals

Through the establishment of the Theodore N. Vail memorial fund, employees of the Bell Telephone system will be awarded distinguished service medals each year in recognition of unusual acts of service.

The plan for awards originated with the late Theodore N. Vail, president of the American Telephone and Telegraph Company, who died in a hospital at Baltimore, Md., April 16, 1920. His widow carried out his wishes and donated a substantial contribution to the fund.

Striking acts of heroism have been performed by telephone operators. A well-remembered example was that of Miss Kathleen V. Lyons, who remained at her post of duty when the Bayless dam gave way, in September, 1911, at Austin, Potter county, Pa. By warning factories and villages in the path of the onrushing waters, she was credited with saving hundreds of lives.

Such devotion to duty will be fittingly recognized by the Bell system. About 200 bronze medals will be awarded each year throughout the country. A certificate engraved on parchment will accompany each award and will state the reason for its being given.

The highest award will be a gold medal, accompanied by a gift of $1000. It is to be presented each year to only one employee of the company in the United States and will be given in recognition of "a very exceptional act of service." Lesser awards will be two gold medals, each accompanied by $500, and eight silver medals, carrying a bonus of $250 each. They will be given without reference to geographical distribution. A national committee will decide on the recipients.

One thing well done is better than many things half done; well done is well-armored success, while half done leaves holes for defeat's darts.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

E. F. W. ALEXANDERSON, chief engineer of the Radio Corporation of America, has been elected president of the Institute of Radio Engineers. Fulton Cutting has been elected vice-president.

E. M. JOYCE of the Southern Pacific System, Los Angeles, Cal., who was captain in the Signal Corps in France during the war and who was badly gassed, moved to Arizona some time ago on account of his health. He now reports that in the climate of Arizona he has entirely recovered from the effects of the gassing.

Thomas E. Fleming, secretary of the Old Time Telegraphers' and Historical Association, says that considerable interest is being manifested in the work of this grand old association throughout the middle and north west. The association, which meets this year in Richmond, Va., has not met west of Chicago since 1902, so that a large corps of eligibles in that section are ready for enrollment. The middle west was at one time the backbone of the association, having met in Omaha in 1892 and again in 1898; in St. Paul and Minneapolis in 1900, and in Salt Lake City in 1902.

Norman C. Courter, of the Morkrum Printing Telegraph Company, Chicago, has accepted a position as electrical maintenance engineer for the Rockefeller Foundation at Peking, China.

This is one of the great philanthropic institutions of the world where centers the medical research, development and training work for the Chinese, and within its walled compounds have been built at great expense many modern buildings of Oriental design, fully equipped to handle the great educational work they are designed to do.

Mr. Courter is a well-known telegrapher, and one of the best automatic trained telegraph men in America. Up to about the ending of the war Mr. Courter was stationed at Washington and Philadelphia for the Western Union Telegraph Company.

POSTAL TELEGRAPH-CABLE COMPANY

Clarence H. Mackay, president of the Commercial Cable-Telegraph system, appeared before the Senate Committee on Interstate Commerce, Washington, D. C., on January 10th to testify on the proposed legislation to control cable landings.

Mr. Mackay stated that he could not too strongly urge the importance of the United States Government insisting on the restoration by England and France of the former German cables which before the war ran between the United States and Germany, and which were seized and diverted by England and France during the war. He stated that these two cables were great assets to American trade with Germany and northern Europe, as is evidenced by the fact that 32 per cent. of the total cable traffic between the United States and Europe was with Germany, and that by reason of the British and French governments cutting and diverting these German cables to England and France American trade was now deprived of those cable facilities. He stated further that in the year 1913 826,000 messages passed over those two German cables between the United States and Germany, and that this figure would show what it means to American trade and commerce to be summarily deprived of those cables. While paying a great tribute to Great Britain and France for their work during the war, he stated that as a business proposition they should be given to understand that in all justice and equity these cables must be restored, and that there was no situation in the whole field of cable communications or in fact in the consideration of the resumption of our trade relations with Germany which demands more urgent and forceful attention.

E. W. COLLINS, general superintendent, has just returned from Cleveland, Ohio, where he was accompanied by Superintendent L. R. Thomas on a trip of inspection.

HALLEY R. DAVIS, resident of Elmhurst, Ill., for many years connected with the western division engineer's office at Chicago in the capacity of electrician, died suddenly in the Cleveland office on the morning of December 8, 1920. He was identified with many of the largest moves of the western division, and at the time of his demise was at work on the new office at Cleveland, under Division Engineer Simpson. Mr. Davis left a wife, a son and a daughter, and a host of loyal friends.

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D. C. De Laney, the new chief operator at Birmingham, Ala., began his telegraph career as a messenger at Atlanta in 1892. He filled almost all of the positions in the office, and became a branch office manager in 1894. He worked in the Augusta office for a while, returning soon afterward to Atlanta. Mr. De Laney worked for the Western Union Telegraph Company in Chicago in 1897, and with Armour & Company for about three years. In 1901 he went to San Francisco, where he remained until after the earthquake in 1905. He returned to Atlanta in 1906, since which time he has been identified in various capacities, including the chief operatorship, until his present promotion to head of the operating department at Birmingham.

W. J. Burt, the veteran telegrapher, is now operator of the Johnstown, Pa., office. Miss M. E. Frederick is manager.

Managers Appointed: E. M. Frederick, Johnstown, Pa.; H. D. Alcorn, Titusville, Pa.; Dorothy Biddlestone, Braddock, Pa.; Miss E. C. Brennan, West Chester, Pa.; A. Watson, New Brighton, Pa.; Mrs. L. N. Kimmons, High Point, N. C.; L. C. Harris, Greenville, N. C.; L. Fountain, Rawlins, Wyo.; P. Hanes, Las Animas, Colo.; Mrs. M. McCaffrey, Keokuk, Ia.; L. M. Gross, Ishpeming, Mich.; B. Marland, Butler, Pa.; Mrs. S. G. Watterson, Cumberland, Md.; A. L. Zaner, Sharon, Pa.; Miss M. E. Conn, Granite City, Ill., and Cecelie Lillie, Ionia, Mich.

E. P. Tully, assistant to the general manager, is on an inspection trip which will cover the principal western points.

J. J. Whalen, traffic manager, left for a brief trip south. He expects to visit the larger relay offices in that section.

Manager Hall of New Haven was a recent New York visitor.

John Ravoli, call clerk in one of our branch offices, died suddenly on the morning of January 2nd.

Miss L. J. Diemer, manager at Herkimer, N. Y., was recently married to Thomas E. Quinn of New York City. Carl B. Schooley of Utica, N. Y., succeeds Miss Diemer as manager at Herkimer.

On the occasion of the transfer of C. J. Moore, city foreman, from Buffalo to New York a purse of $57.50 was presented him from the employees of the Postal at Buffalo, with a letter reading as follows: "Kindly accept this gift as a remembrance from the Postal employees, who regret the departure of a good man and friend, but all wish you success in your new position."

Frank W. Thomas of the line department, Buffalo, pulled a fast one on Foreman Kennedy and the rest of the boys, when he was quietly married a short time ago. We are just getting the facts. Mr. Thomas, who is a veteran of the late war, was wounded in action three times. It is rumored that the fair bride is a former war nurse, who nursed the brawn pole climber through a critical period after one of the battles of the late war.

Philadelphia Postal Notes

C. S. Almes, formerly day wire chief in the Philadelphia operating room, is now associated with Koontz & Company, bankers, New York.

C. F. Thompson, day wire chief, Washington, D. C., operating room, who has been at the hospital sick for some time past, is now at his home very much improved, and expects to return soon to his duties at the office.

A. T. Jordan, for several years night operator at Wilmington, Del., was killed by a stray bullet on New Year's eve, while on his way home from the office. He left a wife and two children.

D. H. Gage, division engineer, New York, was a recent visitor, as was also E. P. Tully, assistant to the general manager.

R. E. Cundy, for several years manager of the Princeton, N. J., office, died January 9th after a long illness.

W. N. Munroe, former manager of the Providence, R. I., office, met with a serious accident recently, when he was run down by an automobile which passed over his ankle, breaking all of the bones. He is making a splendid recovery.

Through the death of Clifford L. Perkins, aged forty-two years, which occurred at Oakland, Me., January 2nd, the Postal Telegraph-Cable Company lost the services of a valued employee, and his associates a good friend. Mr. Perkins was employed as chief operator at the Portland, Maine, office.

WESTERN UNION TELEGRAPH CO.

S. J. Goddard, European vice-president, London, England, returned home on December 29th, after a business trip to this country.

L. McKisick, assistant to the president, has returned to his office after an absence during the holidays.

C. C. Maxson, general inspector of Vice-President Fashbaugh's office, New York, has transferred to the automatic department at Tampa, Fla.

Chief Inspector G. M. Brentlinger of New York is making an inspection of the Havana, Cuba, office.

Among recent executive office visitors was J. G. McNerny of the Buffalo, N. Y., office, who was in the city on January 6th.

W. R. Sherrer of the southern division staff has been appointed division wire chief, southern division, headquarters Atlanta, Ga., vice J. McDowell, transferred to Punta Rassa, Fla., as chief operator.

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Western Union, Eastern Division

C. H. MORTON has been appointed manager of credits and collection at Pittsburgh, Pa.

F. X. SMITH of General Manager Carroll's staff, New York, has been transferred to the office of W. G. Higgins, superintendent of supplies.

G. T. HARRIS has been transferred from district commercial manager of the fourth district to commercial agent at Pittsburgh, Pa.

J. C. MURPHY of superintendent sales office, Richmond, Va., has been transferred to the office of Superintendent J. S. Calvert, Philadelphia, Pa.

L. C. CARMAN, manager at Amsterdam, N. Y., has been transferred to the managership at Mt. Vernon, N. Y., vice C. E. Arnold, granted a leave of absence on account of ill health.

B. COUGHLIN of Schenectady has been appointed manager at Amsterdam, N. Y.

J. M. TIERNEY of Superintendent W. A. Sawyer's office, New York, is now with Superintendent C. B. Horton of the third district.

New York Western Union

JOHN MCCABE, aged fifty-seven years, of the operating room, died on December 20, 1920.

DANIEL CUPID took the part of Santa Claus and presented Miss Columbia Savarese with a beautiful engagement ring.

E. C. REMER of the commercial news department was retired on pension January 1st. Mr. Remer began his telegraph career in 1864 with the American Telegraph Company at Birmingham, Conn.

Western Union, Lake Division

FORMER GENERAL MANAGER T. P. COOK of Chicago, now retired, is spending the winter on the Pacific Coast as the guest of his son, General Manager M. T. Cook of San Francisco.

J. H. PENDRY, for more than forty years connected with the Chicago office, and now division cashier in General Manager A. C. Cronkhite's office, has been granted a furlough, which he is spending with his wife in Manitou, Colo.

SAMUEL A. WATT has been manager of the Saranac, Mich., office for fifty-two years, and Superintendent E. Boening of Detroit recently complimented Mr. Watt, adding that his splendid record in the district was unrivaled in long, faithful and efficient service, in which he may justly feel the greatest pride.

F. T. BEAL, who was an agent for TELEGRAPH AND TELEPHONE AGE in the Chicago Western Union Office, is now at Tampa, Fla., investigating the climate of that State. He reports that there is more summer sunshine there in January than there is in Chicago in June, but there is some rain, especially in the morning. If a man can stand dampness as well as frost, he will get along better than in a cold climate. Orange trees grow in abundance. Grapefruit, tangerines and strawberries are also in full season, and are being shipped by the hundred carloads daily.

WM. H. HEYSER has been appointed chief operator of the Kansas City, Mo., office, vice H. G. Gosting, transferred to the night chief operatorship. Mr. Heyser was formerly night chief operator.

STATE managers' meetings, under the supervision of A. C. Kaufman, general commercial agent, New York, and F. A. Mohr, acting general manager, were recently held at New Orleans, Dallas, Oklahoma City, Little Rock, Ft. Worth, Houston, San Antonio and Tulsa. A large number of managers from Texas, Louisiana, Arkansas and Oklahoma attended these meetings. The cable situation of the world and business conditions generally were discussed at the meetings. J. F. Wilson, district commercial superintendent of the first district, was present at the Texas and Louisiana meetings, and F. H. Austin, district commercial superintendent of the third district, attended those for Oklahoma and Arkansas. The city superintendents of the respective cities named and their selling forces were also present. The meetings were in charge of G. P. Brinkley, district commercial manager.

W. E. RITTER, chief bookkeeper, El Paso, Tex., died suddenly December 8th. He is survived by his wife. Mrs. M. Norwood has been made chief bookkeeper, vice Mr. Ritter.

LOUIS HAGELSIEB, formerly delivery supervisor, El Paso, has accepted a position in welfare work in Kentucky. He has been succeeded by J. P. Hill, formerly cashier. Mrs. Hamilton has been made cashier, vice Mr. Hill. J. W. Smith has been appointed commercial agent, El Paso.

J. W. WARNER, formerly office manager at Houston, has been appointed district commercial manager in the first district, with headquarters at Dallas, vice A. A. Davis, resigned to engage in other business.

G. V. REEVES has been made office manager at Houston.

E. D. BELVIN, chief clerk to J. F. Wilson, district commercial superintendent of the first district, is spending the holidays with relatives in Mississippi.

THE FOLLOWING managerial appointments have been made: Miss C. M. Malone, Heavenor, Okla.; E. Parsons, Monticello, Ark.; Miss A. Starke, Checotah, Okla.; G. W. Graves, Coalgate, Okla.; Miss M. Redmond, Caddo, Okla.; Miss G. N. Patton, Springdale, Ark.; H. F. Ford, Rogers, Ark.; Miss L. M. Buchanan, Bentonville, Ark.; L. J. Manning, Beggs, Okla.; A. C. Williams, Comanche, Tex.; P. A. Norman, Donaldsville, La.; M. T. Kent, McGregor, Tex.; Jennie Lively, Marathon, Tex.; Genie Harris, Pearsall, Tex.; Mary Criswell, De Leon, Tex.; Stella Johnson, Iowa Park, Tex.; Oma Ruthven, Pharr, Tex.; E. B. Luce, Memphis,

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Tex.; R. E. Lockard, Corpus Christi, Tex.; C. A. Lovett, Gainesville, Tex., and Miss Jessie Johnson, Jennings, La.

Western Union Telegraph Company's New Chicago Building

On December 18, 1920, the Western Union Telegraph Company moved the major portion of its operating department from the old building at 111 Jackson Boulevard to the new one at 427 South La Salle Street, Chicago, Ill. The latter is seven stories high and was erected a year ago for the Telegraph Company. It is probably the largest building in the world devoted exclusively to telegraph service.

The testing and regulating and ticker departments are now located on the third floor of the new building; the telephone and city line departments are on the fifth floor, and the Michigan, Illinois and Wisconsin divisions (mostly Morse operation) are located on the sixth floor. The rest of the operating department, mostly multiplex trunk lines, will remain in the old building until the middle of January, when the installation of equipment on the seventh floor of the new building will be completed. In the meantime business is being handled between the two buildings by means of pneumatic tubes.

In the new building messages are carried by an elaborate system of belt conveyors, which bring them to and from distributing centers located on each operating floor. In this way the "office drag" is reduced to a minimum and the number of check girls required is also cut down. The operating tables have been laid out so that large main aisles and ample side aisles are provided.

For the convenience of the employees, there is, on the fourth floor, a large cafeteria, which is being operated to afford service during the entire day. Locker and rest rooms are located on the ground floor, and the remainder of the building is occupied by the clerical forces. In addition, an auditorium capable of seating four hundred people has been built in the basement.

Western Union Traffic Department at Dallas Now in Its New Quarters

The traffic department of the Western Union Telegraph Company moved to its new quarters in the Western Union Building, Main and Pearl Streets, Dallas, Tex., on November 28, 1920. The circuits were cut over at midnight, without a hitch of any kind, and the flow of telegraph business of the southwest moved along as though nothing had happened.

From the standpoint of messages handled the Dallas office of the Western Union is the third largest in the country. Chicago comes first, New York second and Dallas third. The Dallas office handles in the neighborhood of 3,000,000 messages a month and gives service to one of the richest sections of the country.

The Western Union now occupies the entire seven floors of the practically new building at Main and Pearl Streets. The plant as a whole is a model one from the top floor to the basement. Not only will the public be served with the greatest efficiency, but the employees of the company have been considered in constructing the new quarters. Their comfort will be looked after to the greatest extent possible. In the hospital room anything from a toothache to a serious illness can be cared for. In the rest rooms can be found music and intellectual food to the heart's content. In the restaurant hunger can be appeased with first class food at cost.

The traffic department occupies the sixth and seventh floors of the building. A complete conveyor system is in operation on the seventh floor, where the pneumatic tube plant is also situated.

About one-half of the sixth floor is occupied by the Morse section operating room, all the instruments being new, there being one hundred and ninety operating positions. This section is also equipped with a city wire connection unit of sixteen wire capacity. This unit is connected with each of the city branch offices and pony wires.

The other portion of the sixth floor is occupied by the multiplex department.

The telephone department is located on the fifth floor. The offices of the general manager, division traffic superintendent and district commercial superintendent are also on this floor.

The hospital ward on the fourth floor will be in charge of a trained nurse all the time, and a staff doctor will be available at all times for employees. The room is furnished with modern equipment, including an electric sterilizer, operating table, bed and a dental chair. A consultation room adjoins the hospital room.

The ladies' rest room on the fourth floor is a haven of comfort. Reading tables, upholstered chairs, a piano and a victrola are provided. The windows are tastefully curtained. A matron is always in charge.

The testing and regulating room is located on the fourth floor, as is also the chief operator's private office and clerical force. Adequate accommodations are also provided for the men's rest room and lockers.

The third floor contains the division plant superintendent's office, and a school room where students will be taught the use of the multiplex.

The division auditor's office is located on the second floor, together with two school rooms for teaching telephony and Morse telegraphy.

The offices of the city superintendent and clerical forces are on the first floor. The quarters of the city superintendent will be completed and ready for occupancy by January 15th, and arrangements are being completed to formerly move him and his force on that date.

The power plants are located in the basement, as are also various storerooms. One part of the basement is used for a restaurant. It is conducted on the cafeteria plan and can accommodate one hundred and twenty-five persons. The food is of the

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best quality and is furnished to employees at practically cost.

A messengers' rest room is being established on the first floor. It will be equipped with shower baths, and other comforts. A modern tailor shop will be maintained to keep the boys' uniform cleaned and pressed.

The building containing the new headquarters and now known as the Western Union Building is practically a new seven-story structure, and was known as the Masonic Temple. The new quarters contain about twice as much space as that occupied in the old Trust Building, where headquarters were formerly maintained.

French Wire Service in Poor Condition

The French telegraphic service is going from bad to worse, says a French correspondent. The delay and confusion of foreign cable transmission is matched by the confusion and delay attending internal telegrams.

Telegraphic authorities admit the foreign service is poor and give three reasons: First, deterioration of material which could not be renewed during the war and which they are now only able to renew gradually. This is true of the railroads and other public services and can hardly be helped. Second, the authorities claim that the volume of commercial and financial business has increased tenfold compared with the prewar amount as a result of the large number of new banks and business houses now doing business in Paris. Third, they say they have had difficulty with the cable companies, the Western Union and Commercial, over rates.

Until a fortnight ago prewar rates were maintained, and in view of the heavy fall of the franc this caused a loss both to the companies and to the French telegraphic department. Recently, however, the Commercial Company was permitted to double its tariffs, and the Western Union is likely soon to follow suit.

The *Humanite* gave the following report for one day:

"At the central station of Paris 1,000 telegrams were awaiting transmission at 10 o'clock Sunday night for Marseilles only, some of them from the night before. For Nice 700 were waiting, for Cannes 350, and Monte Carlo 200. At 8 P. M. there were 590 cables to America held up, for Africa 646, for Morocco 960, for Dakar 400. Traffic with England, Spain and Italy was practically nil on Saturday."

Automatic Telephony in New York City

Some time next Summer subscribers in certain central office areas in New York City probably will be provided with telephone instruments equipped with dials for use in making local telephone calls by the new machine switching method.

After the installation of this system, these subscribers will be able to make local calls without the aid of an operator by dialing the first three letters of the central office name and a number with at least four numerals.

For the convenience of these subscribers certain changes have been made in the Fall Issue of the Directory so that they can easily determine just what letters and numbers must be dialed.

The three letters of the central office name which must be dialed are capitalized in very black Gothic type and set apart from the other letters in the name.

Because at least four digits must be dialed, zeros have been prefixed to all numbers that had less than four digits.

Where zeros have been introduced at the beginning of numbers they become part of the numbers and must be given, but not as "zero." They should be pronounced "oh," as heretofore. For example, if you want "WAD swth-0019," say to the operator: "Wadsworth oh-oh-one-nine."

Subscribers who will be served by the machine switching apparatus will be given thorough personal instruction in the use of the equipment before the new system is put into service.

Automatic Telephone Switchboard

After exhaustive investigation and long-continued experiments engineers of the Bell Telephone System have produced an automatic switchboard which is said to meet satisfactorily the exacting service conditions imposed. Without deprecating the splendid work of many independent investigators, inventors and manufacturers, it is claimed that until this time there has not been available a system of such universality in application that it could successfully meet the requirements of a complexity met with in city communication needs. Results of trial installations have apparently demonstrated that the new machine-switching system will meet all essential requirements.

Telegraph and Telephone Life Insurance Assn.

Assessment numbers 689 and 690 have been levied by the Telegraph and Telephone Life Insurance Association to meet the claims arising from the deaths of William H. Annis, East Pepperell, Mass.; DeWitt C. Jermain, Brooklyn, N. Y.; George W. Hoxsie, Brooklyn, N. Y.; John G. Scott, Berlin, Md.; George Gardner, Omaha, Nebr., and Samuel A. Duncan, Atlanta, Ga.

Amalgamation of Japanese Electrical Enterprises

It is reported that in the hope of stabilizing the electrical industry, the Japanese Government intends to amalgamate all electrical enterprises. It is believed that this blending of plans and enlarging of enterprises will not only render the exploitation of water power easier and more economical, but will simplify the raising of capital.

J. M. Carson of Statesville, N. C., in renewing his subscription for another year, says that TELEGRAPH AND TELEPHONE AGE is as necessary as three meals a day.

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Telegraph and Telephone Age

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CONTENTS

Engraving of George D. Perry 50
Familiar Name Disappears 51
An Extensive Private Wire Telegraph System. By Thos. S. Brickhouse 52
Canadian Telegraph Men Meet. Daniel McMillan, Inspector, Canadian Pacific Railway Company's Telegraphs, Winnipeg 53
Origin and Development of Radio Service in America 54
Benjamin Franklin's Birthday. The Application of Wired Wireless, Radio and Wireless Telephone to Railway Service Communication Systems. By R. L. Atwell 55
The Application of Wired Wireless (Continued) 56
The German Cables. By C. H. Mackay 57
The German Cables (Continued) 58
Editorial Comment 59
Morse Code Taps Save Life of Man in Vault. John P. Coady, Manager at Rotan, Texas 60
The Railroad. American Railway Association, Telegraph and Telephone Section. Death of Chas. W. Bradley 63
Student's Course in Technical Telegraphy. By Louis Casper. Lesson 20 64
Student's Course (Continued) 65
Future of the Cables 66
New Type Radio Transmitter. Doctor Alexander Graham Bell 67
Current Events. Personal. Postal Telegraph-Cable Co 68
Western Union Telegraph Company 69
Radio Telegraphy. Radio Corporation of America. Radio Links France with United States. The Marconi Wireless Telegraph Company of Canada, Ltd. Pacific Coast Talk Is Heard in Spain. National Electrical Code 70
The Island of Yap Now a Disturbing Factor. All America Cables. Institute of Radio Engineers. Do You Wish to Be Able to Write for Publication? 71
Canadian Telegraph Items. State Control. Industrial 72

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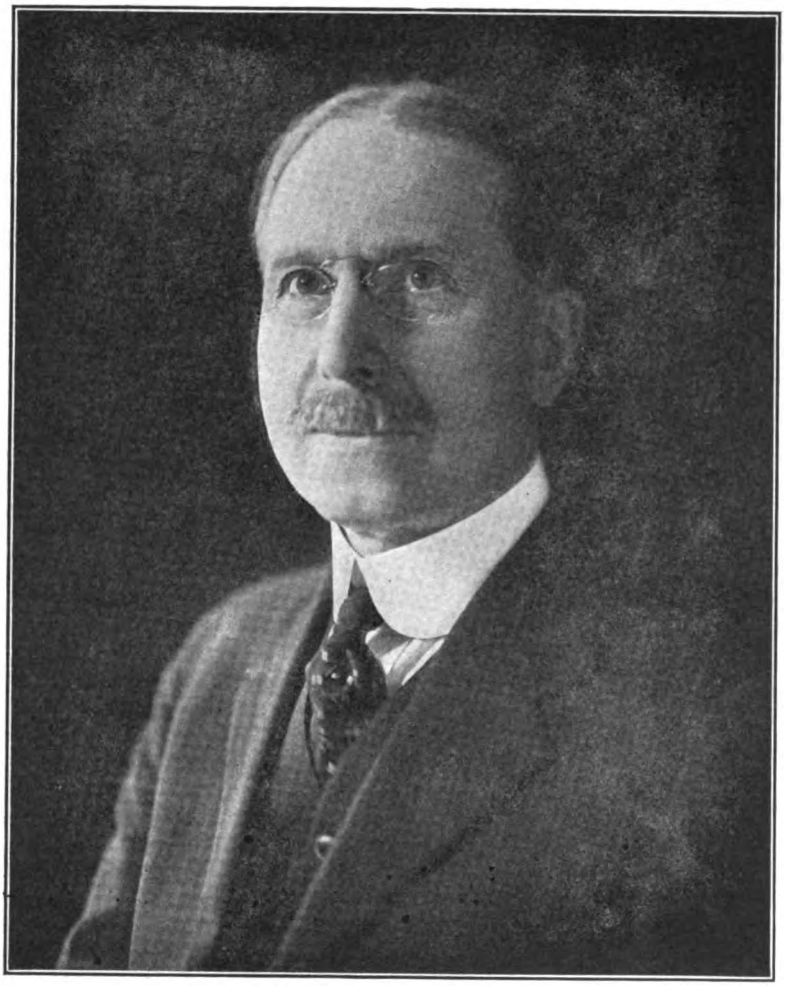

George D. Perry, Toronto, Canada,
General Manager, Canadian National Telegraphs.

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FAMILIAR NAME DISAPPEARS

Great North Western Telegraph Company Becomes Canadian National Telegraphs

The letters G. N. W. and the name they indicate —the Great North Western Telegraph Company, long familiar to every Canadian, whatever his position or walk in life—manufacturer or business man, financier or merchant, public man or ordinary citizen—are eventually to disappear. The Great North Western Telegraph Company is now a branch of the national system, and is to be known hereafter as the Canadian National Telegraphs.

The history of the G. N. W. Telegraph Company covers a period of precisely forty years, the company having been organized in 1881, when it leased the lines of the old Montreal and Dominion Telegraph Companies and merged them into one system. From that time on the G. N. W. grew steadily, and in correspondence with the growth of the country, spreading out and extending its lines until they covered practically all Eastern Canada with a veritable network, while it materially increased its foothold in the West.

In 1915 control of the G. N. W. was acquired by the Canadian Northern Railway, and the railway's already extensive commercial telegraph system being combined with that of the G. N. W., the latter became for the first time a practically Dominion-wide organization. In 1918 the Canadian Northern Railway System, with the G. N. W. and its other subsidiary companies, came into the hands of the Dominion Government, followed subsequently by the Grand Trunk Pacific Railway, when the two great systems, together with the National Transcontinental Railway, were co-ordinated. The telegraph lines of the National Transcontinental Railway were placed under the control of the G. N. W., and now arrangements have been completed for the co-ordination with the G. N. W. and its associated lines of the telegraph lines of the Grand Trunk Pacific.

The first general manager of the G. N. W. was H. P. Dwight, who held the position until 1903—that is, for twenty-two years, when he made way for Isaac McMichael, a Canadian by birth, who had won a name for himself in the telegraph world of the United States. Mr. McMichael died in 1911, and was succeeded by George D. Perry, who, entering the service of the G. N. W. as a young man, had worked his way up by sheer ability and energy to the double position of secretary-treasurer. Mr. Perry continues with the new national system as general manager, the other principal officials being A. C. McConnell, secretary and auditor; D. E. Henry, treasurer; Charles E. Davies, general traffic superintendent; and W. G. Barber, general commercial superintendent.

District commercial superintendents — L. S. Humes, Montreal, in charge of all offices in provinces of New Brunswick and Quebec and offices in province of Ontario east of a line drawn from a point immediately east of Kingston to a point immediately west of Petewawa, and including all offices on the National Transcontinental Railway from Moncton to the Quebec-Ontario boundary line; J. G. Davies, Toronto, in charge of all offices in the province of Ontario west of a line drawn from a point immediately east of Kingston to a point immediately west of Petewawa, and extending to, but not including Port Arthur, Ontario, also all offices on the National Transcontinental Railway from the Quebec-Ontario boundary line to, but not including, Superior Junction, Ontario; J. F. McTaggart, Winnipeg, in charge of Port Arthur and all offices west thereof in the province of Ontario and all offices in Manitoba and Hudson Bay Junction in the province of Saskatchewan, also all offices on the National Transcontinental Railway from and including Superior Junction, Ontario, to Winnipeg, Manitoba, and on branch lines from Superior Junction to Port Arthur, Ontario; G. H. Stead, Saskatoon, in charge of all offices in the province of Saskatchewan (excepting Hudson Bay Junction) and all offices in the provinces of Alberta and British Columbia.

Traffic department—General Traffic Superintendent Charles E. Davies, Toronto, in charge of traffic and inside plant throughout the system; superintendents of railway telegraph service, E. Kenward, Toronto, lines east of Port Arthur, and R. MacMillan, Winnipeg, lines west of Port Arthur; district traffic superintendents, G. H. Walters, Montreal, lines east of Port Arthur, and B. S. Round, Winnipeg, lines west of Port Arthur.

Plant department—District plant superintendents, W. J. Duckworth, Toronto, in charge of outside plant east of Port Arthur; W. Girard, Winnipeg, in charge of outside plant west of and including Port Arthur to and including Saskatoon; W. J. Rooney, Edmonton, in charge of outside plant west of Saskatoon.

Supply department—Superintendent of supplies, George Watt, Toronto.

Commercial news department—Superintendent of reports, R. H. Hathaway, Toronto.

Vast improvements have been made by the company in the matter of installing the most modern telegraph apparatus at their offices, operating the way circuits by Selector concentration units, and the trunk circuits by Morse or Automatics, which comprise five three-channel multiplex printer circuits, fourteen duplex Morkrum printer circuits and twenty-three Morse duplex circuits.

Three-channel multiplex printer circuits are operated between Montreal and North Sydney Cable Station, New York, Toronto and Winnipeg. With this apparatus it is possible to transmit three messages automatically printed in both directions simultaneously on one wire, thereby greatly increasing the capacity of a wire as compared with the Morse duplex or quadruplex method, which is capable of only two messages in both directions at the most. Selectors are installed on these circuits at all repeater stations so that the terminal offices can signal repeater attendants to the circuit in a few moments. The new facilities proposed for the coming year

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will add four three-channel multiplex printer circuits and five Morse duplex circuits. In connection with this immense chain of equipment, there are some 31,000 miles of pole line and 114,000 miles of wire.

The head office of the new system remains in Toronto, the executive staff occupying commodious quarters in the World Building, on Richmond Street West, while the local office, the operating staff and the commercial news department remain at the company's building on Wellington Street East.

An Extensive Private Wire Telegraph System

By THOMAS S. BRICKHOUSE.

(The following story, written by Thomas S. Brickhouse, should prove of interest to everyone connected with things telegraphic. Wires from New York to San Francisco or Los Angeles are no novelty, but when they run all over the continent, and are worked at tournament speed every day, they assume a dignity which places them in a class by themselves.

Mr. Brickhouse, it will be remembered, won the Carnegie Diamond Medal for all-round telegraphic expertness, at the San Francisco Exposition telegraph tournament in 1915, and still holds it. For the past year and a half he has had charge of the wire department of E. F. Hutton and Company's New York office.—EDITOR.)

E. F. Hutton & Company have recently inaugurated coast-to-coast service on what are admitted to be the two most remarkable telegraphic circuits in existence.

Until six months ago we had handled the transcontinental business of the firm on one duplex wire, and although it required the best efforts of the finest talent available, we had "got away with it" in good shape. Finally, however, the business grew to such vast proportions that additional wire facilities became imperative, and another duplex was secured and placed in operation. Formerly all our Pacific coast business was relayed at Chicago, but shortly before the first of 1921, R. E. Mulcahy, the partner of the firm who has been the presiding genius of the ever-growing wire system since its inception, determined that the dictates of progress and competition called for a radical departure from the old way of doing business, and began laying plans to eliminate the relay at Chicago and install instantaneous service between New York and Pacific coast cities. There was much doubt and head-shaking among the engineers of the companies from whom the wires are leased as to whether circuits of this length could be operated at the speed necessary for our requirements, but Mr. Mulcahy was insistent that it be tried, and the result has been of the epoch-making variety.

A brief description of the physical layout of each wire will give the initiated some idea of the obstacles to be surmounted.

The "First Overland," a Western Union wire, runs from New York to San Diego, Cal., with intermediate offices at Chicago, Denver, Salt Lake City, San Francisco, Del Monte, Santa Barbara, Los Angeles, and Pasadena.

The "Second Overland," an American Telephone and Telegraph wire, runs from New York to Vancouver, B. C., with intermediate offices at Chicago, Denver, Butte, Spokane, Portland, Tacoma and Seattle, and a "leg" turns south at Portland, running to Los Angeles, through San Francisco.

Reference to a mileage table will show that the latter of these circuits is approximately five thousand miles long, while the former is close to four thousand.

All these cities receive continuous market quotation service direct from New York, and are thus brought into as close proximity to the New York exchanges as Philadelphia, Pittsburgh or Buffalo. Both wires are full duplexes, and all offices send their orders to New York without interrupting the flow of quotations. To the man who understands the working of a duplex this sounds complicated, as he knows that only one point at a time can send on each side of a duplex. This difficulty is overcome by a system of signals, thus: Suppose the New York receiving side to be idle, Butte, Mont., comes in and identifies himself by making his "sign." Nobody west of Butte can hear him, and to the men at Spokane, Portland, etc., the side of the wire coming east is still idle. Were any one of them to attempt to send, the result would be confusion unless Butte immediately closed his key and allowed them to proceed. But his order is "close to the market," and he has the right of way. The receiver in New York immediately says to the sender sitting beside him "Put Butte in." The sender at once says on the wire "Butte in," using the two letters of Butte's sign, and as every office on the wire hears this, it is a signal for them to keep out until the line is clear. When Butte finishes his order, the New York receiver says to the sender "All out"; the sender repeats this on the wire, and the next office comes in, and is "put in" in the same manner. Sometimes in busy markets all the boys want to send at once, and this is when the level-headedness and experience of the New York operators is brought into full play. They must see that all offices receive an equal amount of wire space, and that confusion is reduced to a minimum. This system has been used for several years on all our duplexes, and the results have been most gratifying.

The "First Overland" is used almost exclusively by San Francisco for sending orders, which frequently run above a thousand a day on one side of this wire alone. As both wires are cut in at San Francisco and Los Angeles, if one wire fails they can immediately switch over to the other, and thus the service is very seldom interrupted.

A few words regarding the men who work such circuits, as these seem to me to be in order. They are the undisputed masters of their craft. They must be "stars" to begin with, and must understand every angle of the broker business. They must take the best of care of themselves, as the physical requirements are very exacting, and they must be mentally alert at all times. Every second counts, and only the man who can size up a situation at a glance, and think ahead all the time, so that he always knows what his next move will be, can hope

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for success. Their hours are short—about seven hours a day, with half a day on Saturday—and their pay is commensurate. Incidentally, if any ambitious young fellow—not too young—reads these lines and thinks he has the "making" of such a telegrapher as I have described, I'd like to hear from him. I have found that such operators are few and far between. Here is one system where the "printers" and "muxes" have no show. The human equation must be ever present.

Richard E. Mulcahy, referred to by Mr. Brickhouse as being insistent on obtaining the best wire facilities to be had, is himself an old-time telegrapher. He has been a member of the firm of E. F. Hutton and Company for many years. Although a native of Michigan, he started his business career as a messenger at Belle Plain, Iowa. He soon became an expert operator, and occupied the positions of telegrapher, train dispatcher, chief dispatcher, superintendent of telegraph, master of transportation, superintendent of construction, and general superintendent. In 1893 he entered the brokerage business in San Francisco, since which time he has been identified therewith. In 1903 he became the Pacific coast representative of E. F. Hutton and Company, and in 1912 he was admitted to a partnership with headquarters in San Francisco. Mr. Mulcahy is an occasional visitor in New York and numbers among his acquaintances many of the most prominent telegraph people in the country.

Canadian Telegraph Men Meet

On January 7th and 8th a conference of telegraph officers from the large central points of the Canadian Pacific Railway Company Telegraphs was held in Montreal to consider additional wire facilities and the necessary new equipment, and any other special needs of the service. Back of the study of facilities required is the principle of "Get together," the co-operation between the representatives at all central points for the fast handling of telegraph business.

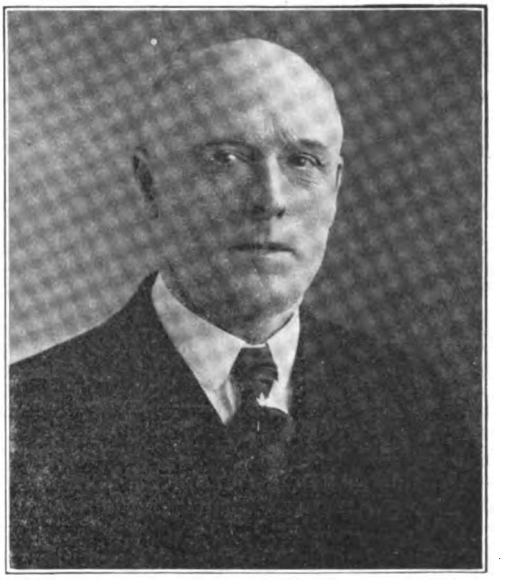
The Canadian Pacific has 15,000 miles of pole line, 126,000 miles of wire; 210 miles of cable, containing 2,600 miles of conductors; and includes direct wires across Canada and between Canadian and American points, as well as via the British Pacific Cable to Australasia. They connect exclusively with the fast commercial cable service and direct with the Imperial and the Halifax-Bermuda system. The Imperial Cable operates between Halifax and London, and in addition to the regular cable service carries a deferred service. They have also direct connection with Louisburg over which they handle Marconi wireless service.

The manager, J. McMillan, invited the officers to luncheon on January 8th. The following were present:

J. McMillan, manager of telegraphs; W. J. Camp, assistant manager of telegraphs; J. Mitchell, superintendent of traffic, eastern lines; W. M. Thompson, superintendent of telegraph; A. Malcolm, inspector; S. L. Elliott, inspector; Robert Murray, chief clerk; R. G. Martin, manager of Uptown branch; C. W. McDonald, chief operator; G. W. Bancroft, agent; C. W. Graham, assistant agent; W. H. Brunini, manager of Board of Trade, F. Corcoran, manager of bank branch; all of Montreal; E. L. Scott, superintendent of traffic, west lines, Winnipeg; A. C. Fraser, superintendent of telegraph, St. John, N. B.; W. D. Neal, superintendent of telegraph, Toronto; D. H. Bowen, superintendent of telegraph, Sudbury; J. P. Griffith, agent, St. John; D. H. Barclay, agent, Quebec; T. H. Holmes, agent, Ottawa,; George Paton, agent, Toronto; J. H. Lahey, agent, Hamilton; G. A. Coates, agent, London, and J. O. Johnston, agent, Sault Ste. Marie.

Daniel McMillan, Inspector, Canadian Pacific Railway Company's Telegraphs, Winnipeg

Daniel McMillan, Inspector, Canadian Pacific Railway Company's Telegraphs, Winnipeg, Manitoba, was born at Rochdale, England, June 15, 1861. He went to Canada in June, 1883, and immediately entered the service of the Canadian Pacific Railway as telegraph repairer at Winnipeg, Manitoba. He was transferred to Medicine Hat, Alberta, in August, 1884. He resigned in April, 1887, to enter the service of the Great Northern



DANIEL MCMILLAN

Railroad, and a year later became chief line repairer on the Chicago and Great Western Railroad. In May, 1899, he returned to Canada and took up a homestead on the Rainy River near Emo, Ontario. He re-entered the Canadian Pacific Railway Company's Telegraphs service as construction foreman in May, 1906, and became station lineman at Winnipeg September, 1908. He was appointed inspector April, 1915, with headquarters at Winnipeg.

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Origin and Development of Radio Service in America

America's position in communicating with the outside world has been most unsatisfactory for years. Its news and commercial services, which are such an important factor in trade, are practically at the mercy of foreign countries, says the *Electrical Review*. Rear-Admiral W. H. G. Bullard of the United States Navy foresaw the danger to America's commerce if foreign interests secured a hold on two new American inventions which have done much to revolutionize the radio system of the world —the Alexanderson high-frequency alternator and the Weagant static eliminator. In the spring of 1919 the British Marconi Company, then operating in this country as the American Marconi Company, placed a $5,000,000 order with the General Electric Company, holders of the patents and manufacturers of the Alexanderson alternator. However, that company decided to consult with the United States Government. The Navy had been in control of radio communication, so the situation was explained to Secretary Daniels. Rear-Admiral Bullard, in company with Commander S. C. Hooper, went to New York City to appear before a meeting of the board of directors of the General Electric Company. They urged the company not to sell, although they had no alternative to offer, for the Navy was no longer in the commercial field and could not buy the machine. The British contract was refused and, on the suggestion of Admiral Bullard, the Radio Corporation of America was organized by General Electric interests, a strictly American concern backed by the country's financial interests and possessed of the patent rights to the Alexanderson alternator.

Attitude of Navy Influenced by Ownership of Operating Company

It was pointed out to the officials of the General Electric Company that as long as foreign interests maintained any control of wireless interests in the United States the Navy would have to take the same attitude as it had previously done and could lend no support to the suggested corporation. Therefore one of the first acts of this new company was to purchase the British holdings in the American Marconi Company. Then with the consent of the stockholders it absorbed the American Marconi Company, thus bringing radio activity in the United States under American management for the first time.

G. C. Corbaley, assistant to the president of the Seattle Chamber of Commerce, in speaking before the National Foreign Trade Convention at San Francisco on the dire needs of better foreign communications with particular reference to conditions on the Pacific coast, recently said:

"This intolerable condition must be corrected. We must have adequate communication facilities with the Orient or America and the Pacific will lose the business turned by the war.

"Wireless offers the first hope of relief. This is largely because of the basic change that is taking place in the world's wireless situation. To most of us wireless is a thing little understood. Even to experts that is largely true. In its early stages wireless made slow progress. This was largely because the Marconi Company was not adequately financed and the big problems of wireless could not command the concentrated technical attention necessary to their solution.

"In 1919 the world's wireless system was revolutionized. This was largely because of two inventions. The Alexanderson alternator was perfected to send a continuous wave of oscillations upon which the message was imposed, thus taking the place of the intermittent sparks. The Weagant static eliminator was perfected to relieve wireless from the atmospheric disturbances that had rendered dependable service almost impossible.

"Both of these developments were perfected under the control of the General Electric Company. The British Marconi Company naturally sought to continue its leadership in the wireless field by securing for itself the benefit of these revolutionary changes. Then took place an event that should be written deeply in the history of American commerce. Due to the fine patriotism of Admiral W. H. G. Bullard these inventions were saved for America and have been made the foundation for a world-wide American wireless service.

"Admiral Bullard is the man who has really built the communications service of the Navy. As a captain he originally organized that service, and under war-time strain he was returned to its command.

"Impressed with the necessity for a world-wide service owned by Americans and operated by Americans, he went before the officers of the General Electric Company and pleaded with them to hold these inventions and to make the wireless of the future an American institution.

"Admiral Bullard won his point. The General Electric Company purchased the control of the American Marconi Company and reorganized it as the Radio Corporation of America, with a provision in its laws that 80 per cent. of its stock must always be owned by Americans.

"The Radio Corporation of America is preparing to cover the world with a modern and efficient wireless system. One of the first steps in this plan is to be a comprehensive solving of the communications problem of the Pacific as far as wireless can ever solve that problem. A great modern sending station is to be built on the Pacific coast of the United States, able to send messages direct to receiving stations in the principal cities of Japan, China, the Philippines and the Straits Settlements.

"A concession has been secured from China to permit the erection of a similar sending station near Shanghai strong enough to talk direct to Seattle, Portland, San Francisco or Los Angeles.

"When this system is fully in operation wireless messages can be filed in any large city in the United States, or in the Orient, can be relayed by wireless to the sending station on their side of the water, and then sent direct by wireless to the city of their destination.

"All of this sounds too perfect to be true. It is probably more perfect than it will be for many

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months to come, but I have tried to give you the idea that has been approved by the General Electric Company and that is in process of realization by E. J. Nally and his associates."

It was about twenty-two years ago that Admiral Bullard was first attracted by wireless work. During his student days at Annapolis electricity and electrical engineering had interested him. These studies he carried on following graduation and soon became known as one of the electrical experts of the Navy. Wireless work appealed to him both as an electrical engineer and as a military officer. With his knowledge of electricity the military possibilities that lay in wireless were readily apparent. He is now director of the Navy communications service and was the first superintendent of radio service from 1912 to 1916, since enlarged to embrace all forms of communication activities.

Marconi Equipment Brought to This Country in 1899

In 1899 Marconi brought to this country from Italy three sets of his new wireless aparatus, the immediate purpose being to use them in reporting the international yacht races that year. The Navy Department appointed a commission to observe and report on the working of the system, and following the report of this body, the Navy placed the battleship *Massachusetts,* the armored cruiser *New York* and the torpedo boat *Porter* at the disposal of Marconi for further experiments. A shore station was established near New York City, the first in America. The three vessels were the first in the Navy so equipped, and thus the beginning of the Navy radio service.

The growth and development has been remarkable. No part of the Atlantic or Pacific is too far away to be out of reach of a radiogram from an American naval station. In fact, it has been possible for the United States Government to keep in constant communication with its forces abroad through radio from the New Brunswick station equipped with the Alexanderson high-frequency alternator.

Benjamin Franklin's Birthday

Monday, January 17th, the birthday of Benjamin Franklin, the father of the thrift movement in America, was observed throughout the United States with appropriate ceremony.

Radio Rooster Crowing

Rock Island, Illinois, claims to have the world's record long distance crowing rooster. His crow can be heard more than 600 miles away. While R. K. Karlwea was sending a wireless telephone message to Dallas, Tex., the rooster crowed and the operator at the receiving end said the cock's "mornin's morning" was so loud it awoke his wife and she got up to prepare breakfast.

The Application of Wired Wireless, Radio, and Wireless Telephone to Railway Service Communication Systems

By R. L. Atwell,
Telephone Engineer, Southern Railway System, Charlotte, N. C.

The wonderfully successful development of employing wired wireless, radio and wireless telephone in increasing and extending the communication facilities of the nations engaged in the World Wai has opened a field of probably inestimable value to railway communication systems. While a few of the most progressive railway companies have and are now experimenting in the employment of these transmission methods, the serious investigation of their application to railway service has not been undertaken upon the extensive scale that is unquestionably warranted.

The communication requirements and services of the larger railway systems have so developed and expanded within recent years as to necessitate their adoption of the most efficient transmission methods and equipment. The telegraph and telephone department can no longer be regarded as a necessary evil, but must now be seriously acknowledged as a railway department of the first importance in the efficient operation of the railway system. It is the one department that forms the intercommunicating link between all other departments and its consistent, reliable functioning is essential to the general progress of the railway.

The original application of the telegraph to railway operation was for the primary purpose of moving trains over stretches of single track road. This use of the telegraph has today expanded until, with the assistance of the long distance telephone, all railway departments and division headquarters are closely knit together in an extensive communication system, strikingly similar to that of the Bell Telephone Sysem.

This extensive railway communication system has been built up, section by section, of land wire lines, connecting up the way stations, block offices, division headquarters, and general offices. The operation of these land wires, telegraph and telephone, has through very exhaustive investigations and valuable inventions, been advanced to an extremely high point of efficiency, but in spite of this development of their application to raliway service, there still remain certain well defined limitations and unavoidable sources of interrupted and unreliable service.

Regardless of the high physical properties of the land wire lines, and the most efficient maintenance of same, they are constantly and periodically subjected to conditions that limit their consistent performance and value to the railway service.

The successful development of unlimited communication through the use of radio transmission has created a field which may generally be applied to railway communication systems, and afford a

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service far superior to that now enjoyed over land wires. Wireless communication, radio or telephone, through the rapid development it is now experiencing, undoubtedly offers a communication system that will supplant in reliability and usefulness the present land wires.

Consider the application of wired wireless, radio and wireless telephone to a railway system like the Southern, covering with its 9400 miles of track such varying topographical country, and encountering such varying climatic conditions—extending on lines east from Washington to Atlanta, Ga., and Olltewah, Tenn., and on lines west from Cincinnati, Ohio, to Jacksonville, Fla., and New Orleans, La. The traversed northern territory is subjected to extreme and violent changes in temperature accompanied by heavy snow and sleet storms, while the traversed southern territory is subjected to torrential rains and destructive gulf disturbances. Important administrative, operating and commercial offices are located at Washington, Danville, Va., Norfolk, Charlotte, Greenville, Charleston, Savannah, Columbia, Asheville, Knoxville, Atlanta, Jacksonville, Cincinnati, Richmond, Va., Memphis, St. Louis, Louisville, Birmingham, Chattanooga, Mobile and New Orleans.

The business of a railway company is transportation, passenger and freight, dependent upon continuous and efficient movement of trains, facilitated by telegraphic or telephonic communication. Interruptions to its land wire service spells interruption to its train service and general conduct of railway business. That these wire service interruptions will continue to occur, at great expense to the railway company, must be acknowledged in spite of all efforts to strengthen the land wires to resist them. Then how can these unavoidable interruptions with consequent losses be remedied? With the installation of radio, wired wireless or wireless telephone for dispatching of its trains, and general transaction of its business.

Exhaustive investigations already performed by a few of the railway companies indicate that with certain further improvements in the design and adaptation of radio and wireless telephone equipment and apparatus to railway service, it is entirely feasible and practical to efficiently and economically control the movements of its trains during the most severe and unfavorable weather conditions.

The volume of railway business handled between railway general offices and division offices, between one division and another, and between way stations and division offices, that requires accurate and prompt transmission, impossible through the mails, is far greater than is generally realized by operating officials.

Through the establishment of wireless telephone and radio stations of required capacity and radius at such points as Washington, Charlotte, Atlanta, Norfolk, St. Louis, Cincinnati, Mobile, New Orleans, Chattanooga and Birmingham, the entire Southern Railway System would be linked together through a communication system that would provide the greatest speed of message transmissions and continuous reliability of service. Local way station messages and communications destined for division points or general offices could efficiently be handled over land wire lines to these radio stations and then relayed; also communications destined from one division point to another, or to the general offices in Washington, could be handled directly via radio or wireless telephone.

The consistent and reliable communication service incident thereto, and the greater flexibility of such a system, undoubtedly would produce such marked increased efficiency in the general operation of the railroad as to warrant the initial expense of the installation. The gradual adoption of this system might be started with the installation of stations at Washington, Atlanta, Cincinnati and New Orleans, adding stations as conditions and growth of business justified.

The gradual installation of this railway radio and wireless telephone system would release such an amount of wire line plant and associated equipment, together with its large annual maintenance charges, that the capital derived therefrom will compare very favorably with the initial costs of the improved system.

The United States is today experiencing a period of great and intensive development, especially throughout the territory served by the Southern Railway System, and the railroads are out in the forefront, lending all their resources and energies to the furthering of this national progress. The prosperity of this country and that of the railroads is linked hand in hand, and as the business of the railroads increases the already severely taxed land wire line communication systems must be replaced by more efficient and reliable wireless systems.

Overheard in the Newest Telegraph Company's Restaurant

He—Are you sure that these hot cakes are thoroughly cooked?

Waitress—Sure. They were cooked by electricity.

He—Well, take 'em back and give 'em another shock.

New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

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The German Cables

Clarence H. Mackay, president of the Commercial Cable Telegraph System, recently appeared before the Senate Committee on Interstate Commerce at Washington, D. C., in relation to the German cables. His testimony was briefly referred to in our issue of January 16th.

Mr. Mackay's statement in regard to the German cables was as follows:

German Cables in the Atlantic

You have referred to the former German cables, seized by England and France during the war. We are very largely interested in this question by reason of our actual investment in the cables and contract relations with the German Cable Company. The two German Atlantic cables were laid in 1900 and 1904 and ran from Emden, Germany, to the Azores (1,960 miles) and thence to New York (2,357 miles), where they were brought into our cable station and operated by the Commercial Cable Company under a contract dated August 3, 1899. That contract has still 20 years to run and it was not only valuable to us for its financial benefits, but these two cables, operated with the greatest efficiency, were great assets to American trade with Germany and North Europe, as is evidenced by the fact that 32 per cent. of our total cable traffic was transacted between the United States and Germany. The history of the seizure of these cables by England and France during the war is already fully known to you and to the Government. The sections of these cables between Emden and the Azores were cut originally in the English Channel immediately following the declaration of war between Germany and England on August 4th, 1914. In March, 1917, they were cut at points 648 and 610 miles, respectively, from New York, and one of them was diverted by the British Government into Halifax, Nova Scotia, and since July 1st, 1917, has been used by the British Government as part of its Imperial telegraph and cable system. The French Government did not remove the other German cable from our shores, but in August, 1917, the French Cable Company communicated to us a request from the French Government to turn this cable over to the French Cable Company in New York. We naturally questioned the purpose of this request and it was not pursued. We did, however, lodge a protest against this proposed seizure with the Department of State on August 9th, 1917. In November, 1917, the French cableship *Jeramec* arrived at New York and cut both of the German cables approximately five miles from their landing place at Far Rockaway, New York, and diverted one end into the French company's landing place at Coney Island. What became of the other end, namely, the end which was part of the 648 miles of cable cut out of circuit by the diversion of the cable by the British into Halifax, we do not know. In the meantime the French Cable Company applied for, and received a permit from the United States Government, to land a cable in the United States, ostensibly for the purpose of connecting with the German cable seized by the French Government. It was only necessary for the French company to lay a short length of cable from the French Cable Company's landing place at Coney Island to the point where their cableship cut the German cable off Far Rockaway and establish connection. I would like to call attention to the fact that this German cable seized by the French Government was taken from our terminal station at Far Rockaway, New York, to the French Cable Company's terminal station at Coney Island, New York, before that company had the necessary equipment to operate it, and we believe that it remained idle for over twelve months during the war; in fact, it was not put into operation by the French company until March, 1919 (four months after the war), and even now it is not able to operate it with the same efficiency with which it was operated by the Commercial Cable Company prior to the war. As the question of the final allocation of these German cables in accordance with the provisions of the Peace Treaty is in the hands of a specially appointed committee, and as we have furnished that committee with all the data and facts concerning our interests, I will not trouble you with any unnecessary detail, except to say that we believe the most equitable settlement of this question would be the restoration of the status before the war. To do this would automatically restore a very valuable asset to this country, viz: direct communication between the United States and Northern and Central Europe; it would remove the political jealousies which are bound to arise from the fact that one government obtains greater advantages than another, especially at the expense of a friendly ally.

I am advised that under International Law there is grave doubt as to the legality of seizing enemy cables during war, but I submit that there must be some differentiation made between the legality of seizing enemy cables connecting an enemy country (Germany) with neutral territory (the Azores) and seizing enemy cables which only connect neutral or allied nations, namely, the United States and the Azores. I understand there is no rule of International Law or practice of nations, allowing belligerents to appropriate the property in cables, even though they have been cut and diverted in the course of military operations.

There may be a division of opinion as to whether enemy cables between neutral and belligerent territory may be cut on the high seas, but as to enemy owned cables between two neutrals or allies, such as between Portugal (the Azores) and the United States, as mentioned, there could have been no necessity of war justifying the cutting and diversion of either of these cables, as they were not susceptible of use by Germany for the conduct of war. I think it is very important to emphasize that the possession of the sections of cable between the Azores and New York was in no sense necessary to either England or France, either in prosecuting

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the war or in preventing Germany from using them. If England and France should try to justify the seizure of these German cables between the Azores and the United States on the ground that they were important as lines of communication in prosecuting the war, the answer is, that they could have been put to much more efficient and immediate use by leaving them where they were, instead of disturbing them and causing them to remain idle for many months as a result thereof. The United States was a belligerent and an American company was in the position of being able to operate the New York-Azores sections immediately, because it had the necessary apparatus and equipment to do so.

I would emphasize the fact that both cables were cut between 600 and 700 miles from New York, indicating that they were not cut for the purpose of interrupting communication under the necessity of war, but for their subsequent diversion and appropriation. The actual diversion of the cables took place in July, 1917, by the British, and November, 1917, by the French, after the United States had entered the war. It is therefore fair to say, that neither England or France can justify the seizure of these two German cables between the Azores and North America as a war necessity, because both the United States and Portugal (the Azores) were allied with England and France, in the vigorous prosecution of the war.

I cannot urge too strongly the importance of the United States Government insisting on the restoration of these cables, to service between the United States and Germany. Neither of these cables touched British or French territory, and there is no justification for their diversion. In making this statement, I assure you that I am not governed by selfish motives, or that I harbor in the slightest degree a feeling of antagonism against our allies. On the contrary, it has been my good fortune to make associations, both personal and business, of many years' standing, and my admiration for the indomitable stand by England and France in the successful prosecution of the most historic of wars has been profound. It is one of the most remarkable situations which has developed out of the war that we should thus be deprived of this commercial intercourse with Germany and central and northern Europe, and speaking as an American and in the interests of American trade, I repeat that there is no situation in the whole field of cable communications, or in fact in the consideration of the resumption of our trade relations with Germany which demands more urgent and forceful attention. When I tell you that in the year 1913 826,000 messages passed over these two cables between the United States and Germany you will realize what it means to American trade and commerce to be summarily deprived of these cables. Our Allies should be given to understand that in all justice and equity these cables must be restored.

German Dutch Cables in Pacific

I would also like to refer briefly to the situation in the Pacific respecting the cables seized by Japan between Guam, Yap and Shanghai (2,340 miles laid in 1905). As you are aware, the Deutsch Niederlandische Telegraphengesellschaft, a company formed in Germany but largely supported by Dutch capital and subsidized by the German and Dutch Governments, owned cables running from Guam to Yap, there diverging, one line going south to the Dutch Indies, and the other going north to Shanghai. We operated the Guam end of that cable under a contract with the German Dutch Company. All messages for the Dutch Indies were sent via Yap under normal conditions, and during interruptions of our cable between Guam and Manila, which cut off all communication with the Philippines and China by our route, we diverted traffic via Yap to Shanghai over this German Dutch system. Hence, these cables were very important in maintaining uninterrupted communication with China and the Philippines, and the seizure of Yap by the Japanese, and the diversion of the cable into one of the Japanese Islands, deprives us of this alternative route. There was only one other alternative route to China, and that was via Japan. If Japan continues to retain the Yap Shanghai cable, it will mean that all traffic destined to China and the Philippines during interruptions of our Guam Manila cable will have to transit Japan, and the volume of traffic to the Philippines would not justify the laying of such a cable which would be practically idle most of the time.

The same arguments as to the interference with American cable communications, applies here as to the seizure of the German-Atlantic cables. No part of these cables in the Pacific touched Japanese soil, but one end touched American territory (Guam) and yet the Japanese have seized this German Pacific cable system to the detriment of American trade with China and the Philippines, and advantage to their own. I here also strongly submit that the United States in consideration of its co-operation in the war should not be affected by being deprived of an important alternative means of communication with China and its Far Eastern possession, the Philippine Islands, which it enjoyed before the war.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by Telegraph and Telephone Age, 253 Broadway, New York.

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EDITORIAL COMMENT

The Cable Situation

La Nacion of Buenos Aires, Argentine, on January 18th devoted a long editorial to the refusal of the United States Government to permit the Western Union Telegraph Company to land a cable from South America in the United States to provide a new line of communication between the North and South American continents.

"The opposition of the United States to this most important problem concerning communication between the rest of the world and herself is not a legitimate one," says the editorial, "since the existence of international relations presupposes a moral obligation. The conduct of the North American Government prejudices both South American interests and her own, because every international exchange of commerce and ideas progresses proportionately to the facility with which it is exercised.

"When it is proposed to establish a new line of communication between two points it is because there exists a sufficiently important need. Therefore it is as important to the United States, in the realization of her desire for trade expansion, as for South America, in extending the radius of her foreign relations, to possess a new line of communication which is destined to overcome the present congestion and which the sole use of existing lines sooner or later will render inevitable. It would be most appropriate if Secretary Colby, together with the echo of spontaneous cordiality with which our nations have allied his country and himself, could carry back some mention of these questions of the day, in which the United States wields a preponderant influence."

In reply to the Western Union Telegraph Company's suits in Washington against Federal officials, Assistant United States Attorney Earl Barnes, in charge of the Civil Bureau, on January 18th filed a suit in equity in the Federal Court, naming the company. The action is another outgrowth of the differences between the Government and the company over the latter's attempts to land a cable on Miami Beach, Fla., as a link, via Barbados, in the British cable line to Brazil.

The fear was expressed that the President and the Navy Department might not be successful in preventing the company from "surreptitiously" laying the cable.

After Mr. Barnes had filed the papers he asked Federal Judge Augustus N. Hand to grant a temporary injunction restraining the company from any further move in Florida waters.

The Government set forth that Americans could lay cables wherever they pleased on terms of equality with foreigners. This was a reference to the Government's allegation that the Western Telegraph Company, a British concern not made a party in the suit, was "monopolistic" in that it had obtained the exclusive rights to cable communication with Brazil. The Western Union is said to be interested with the British corporation in the Brazil lines, through the projected link to Miami.

"It is unlawful for any person without the consent of the President or of the Congress," the Federal petition reads, "to land in the United States any cables connecting the United States with any foreign country. The President is vested with power to prevent the unauthorized laying of any cable connecting the shores of the United States with any foreign country."

After citing the exercise of this power in the past, the brief continued: "The British company, the Western Telegraph Company, has obtained from the Government of Brazil and holds an exclusive franchise or concession which provides that no other company may connect by submarine cable any two of the points within Brazil touched by the lines of the British company. The lines of the British company touch at all of the principal coast cities of Brazil. In order to succeed financially, any direct cable line from the United States to Brazil must collect business from several points by cable extensions, the condition of the Brazilian land lines being such that they cannot be effectively used for this purpose. The practical effect, therefore, of the monopoly is to prevent the construction of any direct cable line from the United States to Brazil by any American company."

The brief then recounted the early attempts of the Western Union to land its line at Miami, and disclosed that in a letter dated July 20, 1920, President Wilson forbade the proceeding. The President characterized the effort to land a cable as in "defiance of law."

"Having failed to land its cable at Miami Beach," the brief added, "the defendant thereupon conceived the plan of circumventing the constituted authorities by splicing into its cable from Barbados a branch cable to connect at Cojimar, Cuba."

The Longest Underground Telegraph and Telephone Cable System

The American Telephone and Telegraph Company's underground cable that connects Boston with Washington, a distance of four hundred and fifty miles, is the longest underground telegraph and telephone system in the world. Sweden is about to install an underground telegraph and telephone system between Stockholm and Goteborg, a distance of three hundred and twenty miles. The work is to be done by American manufacturers and has already been started. It will take eighteen months to finish the undertaking.

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Morse Code Taps Save Life of Man in Vault

Bank clerks and employees of concerns where large vaults are used to store money, books and documents may be expected to develop an epidemic of the Morse telegraph code. This is expected to follow publication of the story of how Assistant City Treasurer Arthur Brenner signaled directions for his release from one of the municipal vaults in Philadelphia on January 17th, after he had been imprisoned six hours.

Brenner, who in his younger days was a telegrapher, found himself locked in the vault at 4 o'clock in the afternoon. He immediately began sending out an "S. O. S." in Morse signals by pounding on the wall of the vault, and he was fortunate, because the night watchman, Charles Hockwald, was able to read the taps.

Hockwald made out the name and address of George W. Morrison, chief clerk of the office, the only man besides Brenner who knew the combination of the lock on the vault door. Morrison was called from his home and Brenner was released six hours after he had been locked inside by a teller, ignorant of his presence in the vault.

Luckily for the imprisoned man, the vault was not equipped with a time lock, it being used only as a storage place for documents and not money.

Brenner retained his presence of mind throughout the ordeal. He slept part of the time, later opening drawers along the side of the large vault to release additional air when the air became so stifling that he became drowsy.

No one had seen Brenner enter the vault. He was on a circular balcony searching for a pay warrant which had been needed a few minutes before closing time.

Brenner heard Medalay, a teller, ask the cashier if everything was all right. The assistant treasurer shouted a warning not to close the doors, but before he could reach the entrance of the vault the doors swung shut.

No one discovered Brenner's plight until the night watchman heard the tapping.

"When I heard the door close," said Brenner, "I figured there was enough air to keep me alive until morning and I piled some books on the floor, placed my coat over them to make a pillow, and, lying on the steel floor, went to sleep.

"When I awoke I found my plight had not been discovered. I turned over and went to sleep again. When I awoke for the second time my hand came in contact with a loose board. That gave me another idea. With the board I began banging against the wall of the vault, near the top, where it is not so thick.

"I banged out a call for help in the Morse code. After what seemed an age I heard a responsive tapping from the outside and knew my call had been heard. I then spelled out my name to the night watchman and told him my predicament. He signaled back 'All right; I will get you out.'"

John P. Coady, Manager at Rotan, Texas

John Philip Coady, who was recently appointed manager of the Western Union Telegraph Company at Rotan, Texas, has had an interesting telegraph career. Mr. Coady was born at La Crosse, Wis., July 25th, 1873. In 1888 he entered the service of the Chicago, Milwaukee and St. Paul Railroad Company, and later the Northern Pacific service, engaging with the Western Union Telegraph

JOHN P. COADY

Company at Portland, Ore., 1892. Four years later he was copying Associated Press at El Paso, Texas. While night chief at El Paso at 3 a. m. one morning, San Francisco asked to be cut through to Kansas City quick. K. C. answering in a minute or two S. F. requested K. C. he be given Chicago quick, and when Chicago answered S. F. asked for New York. Mr. Coady was beginning to get interested. A little later he heard the first news of the overthrow of the Hawaiian Queen, and the raising of Old Glory, which later on resulted in a new territory being added to the Union.

Mr. Coady has worked for the Western Union and Postal companies in Chicago, St. Louis, Kansas City, Washington, Jacksonville, Fla., New Orleans, Denver, Omaha, Portland, Seattle, Birmingham, and many other places. Mr. Coady was also manager of telegraphs in Mexican Central general office in Mexico City, relieving B. C. Elder, now of San Francisco.

Mr. Coady has written many articles for publication in various journals.

John McWilliams, manager of the Great North Western telegraph office at Father Point, Quebec, in renewing his subscription for another year, writes, "No telegrapher can afford to do without the AGE or he will become a back number."

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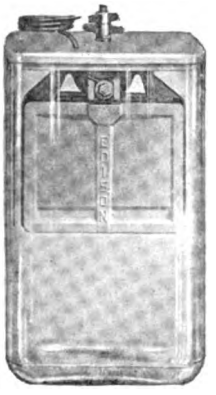
The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.



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Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

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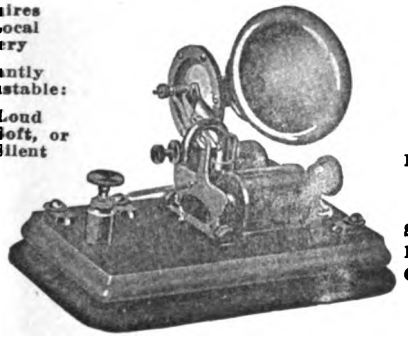

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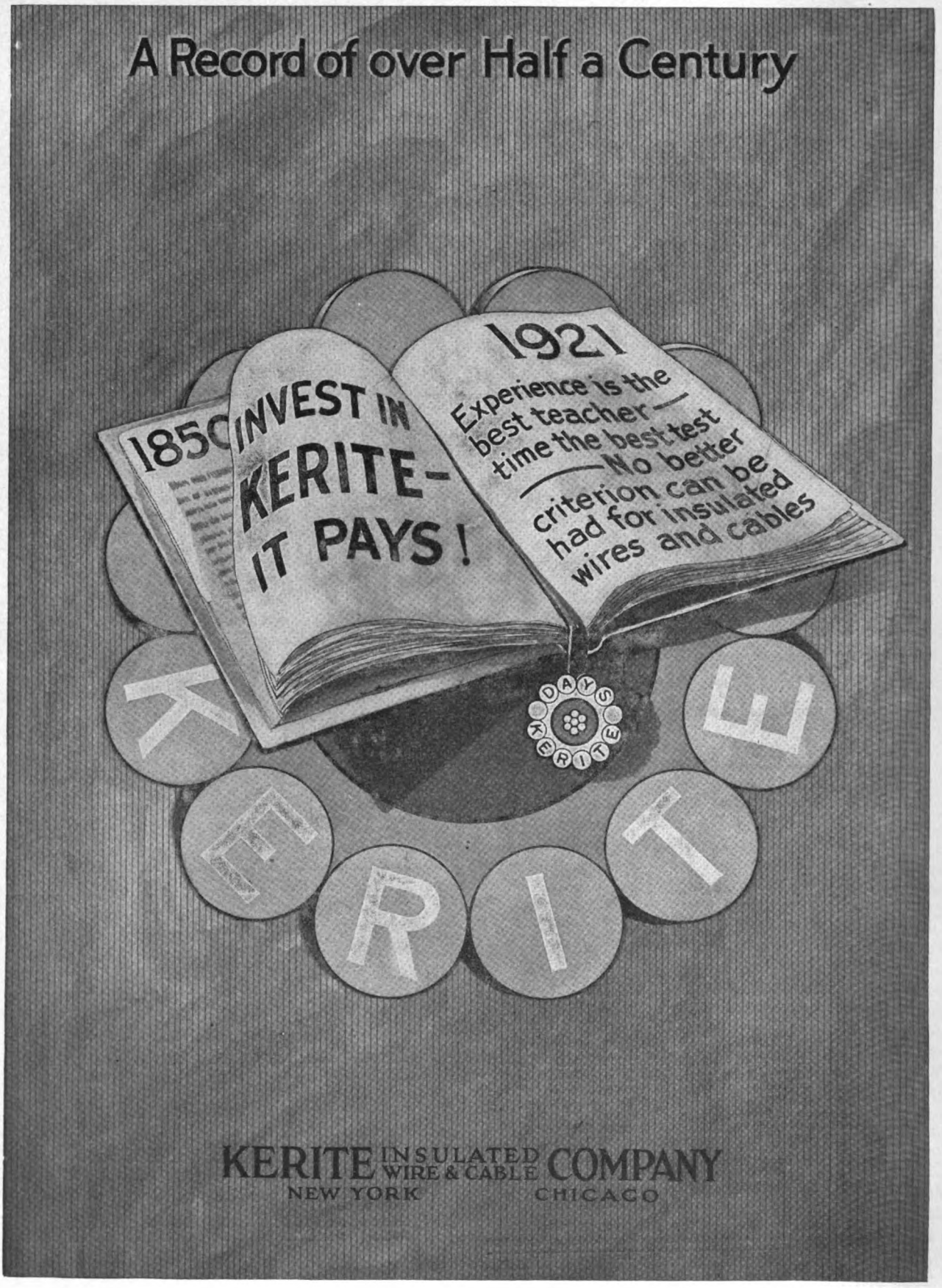

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THE RAILROAD
TELEGRAPH AND TELEPHONE

American Railway Association, Telegraph and Telephone Section

To the Representatives of members and affiliated Members:

Existing conditions has made it necessary for the Board of Directors to curtail all activities of the Association except those pertaining to safety and economy in operation. Accordingly, it has been decided advisable to postpone the Spring session of the telegraph and telephone section to be held at Atlanta on March 23, 24 and 25.

The Fall session, Annual Meeting, of the Telegraph and Telephone section, will convene in Cleveland, Ohio, on September 21, 22 and 23. Formal notice relative to the session will be issued later.

Respectfully, H. Hulatt, Chairman; W. A. Fairbanks, Secretary; J. E. Fairbanks, General Secretary.

THE MEETINGS of the several committees of the telegraph and telephone section of the American Railway Association which were scheduled to meet in Chicago on January 17th, were called off on account of the action of the Board of Directors of the American Railway Association to curtail all activities except those pertaining to safety and economy in operation.

THE NEW YORK CENTRAL LINES joint superintendents of telegraph, held their regular quarterly meeting at the Hotel Statler, Buffalo, N. Y., on Wednesday, January 26th, at which time regular routine matters were acted upon in connection with the advancement of the system's lines, telegraph and telephone facilities. All of the joint superintendents of telegraph were present.

H. Hulatt, manager of telegraphs, Grand Trunk Railway System, Montreal Que., chairman of the Telegraph and Telephone Section of the American Railway Association, has been elected an associate member of the Institution of Electrical Engineers, London, England. He is also an Associate Member of the American Institute of Electrical Engineers.

Death of Charles W. Bradley

Charles Whiting Bradley, aged eighty-five years, superintendent of telegraph of the Chesapeake and Ohio Railroad Company, Richmond, Va., and president of the Old Time Telegraphers' and Historical Association, elected at Toronto, August 31st, 1920, died in a sanatorium at Nyack, N. Y., on January 14th. Interment was at New Milford, Conn., on January 17th, of which place he was a native. Mr. Bradley began his business career as a messenger at New Haven, Conn., for the old Bain Telegraph Company in 1851. He was the first superintendent of telegraph of the old Atlantic and Great Western Railroad Company, now part of the Erie System. He had been identified with railroad and telegraph interests during his long career in various official capacities, until 1911, when he was appointed superintendent of telegraph of the Chesapeake and Ohio System. Mr. Bradley had been in poor health of late. The funeral services were attended by representatives from the Chesapeake and Ohio and West Shore Railroad companies, Western Union Telegraph Company and Old Time Telegraphers' and Historical Association.

EVERY construction superintendent and lineman has use for the EVER-HOT SOLDERING IRON AND BLOW TORCH, manufactured by Belfry and Craighead, 1526 Tribune Building, Chicago, Ill. The advertisement of the concern appears on another page of this issue for the first time and we desire that every telephone and telegraph lineman who has to do with this class of work should become interested in the product of Belfry and Craighead. This firm will be pleased to answer any correspondence.

DIAPHRAGM SOUNDERS are helping to solve the local battery problem on railroads and in commercial telegraph offices the world over. Diaphragm Telegraph Sounders are instantly adjustable, loud, soft or silent. These instruments are trouble-proof and they save battery cost. Address Railways Labor Saving Device Co., 1108 Arlington Ave., Davenport, Iowa, who will be glad to send descriptive folders on request.

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Student's Course in Technical Telegraphy

By Louis Casper.

Lesson No. 20.

In Lesson 19, a Bridge test record was reproduced in fac-simile, showing a method of recording each individual test. One of the most desirable features in a form of this character is the fact that a record is made of the weather and temperature, together with the data covering the measurements of both loop and Varley tests at that particular time. By comparing measurements previously recorded on these forms of the same wires, between similar stations, it is often possible to make comparisons of figures, and by such means be enabled to obtain a closer location of the wire trouble. This is particularly true in comparing dry and wet weather conditions on a certain route.

In wet weather, a wire having a number of imperfect joints will measure much shorter than the same wire under dry weather conditions since the moisture tends to greatly increase the conductivity of the joints and to apparently lower the resistance of the wire.

Referring again to Varley loop tests for the testing of wires. In some instances the fault F to a ground (Fig. 40) is of such high resistance that when the Varley test is applied after the loop measurement is obtained the galvanometer in the bridge is barely affected by the battery current, which is greatly enfeebled as the result of this high resistance. In that case it is necessary to use another battery of greater strength. This is generally obtained from a dynamo or storage battery of about 160 volts. When a heavy battery is used, great care must be exercised, and it is advisable to have a reducing rheostat or resistance unit cut in the Varley circuit to obviate any danger of overheating the coils of the bridge.

It is desirable also to insert a milammeter in circuit with the battery so that a check can be made of the current entering the bridge.

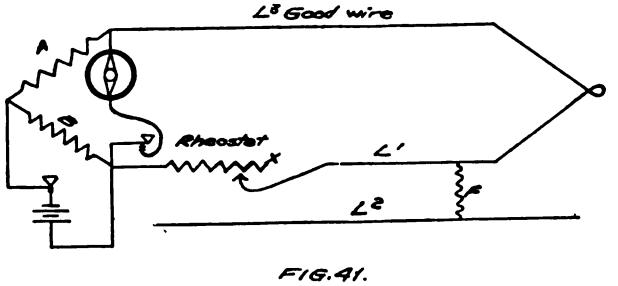

FIG. 41.

Figs. 41 and 42 show a Varley measurement for a cross between two wires when a clear wire is available. The clear wire is looped with one of the crossed wires at some point beyond the cross and then a loop measurement is made in the usual manner (Fig. 41). The Varley measurement is then applied as shown in Fig. 42.

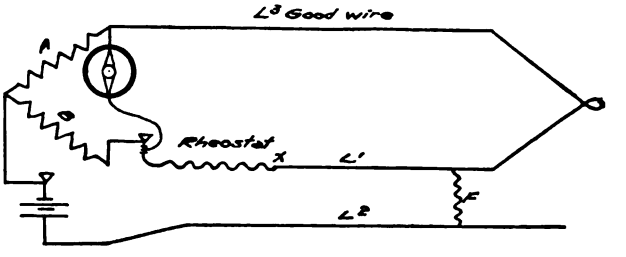

FIG. 42.

It will there be seen that the battery current in the bridge instead of following a path to the loop through the distant fault and the ground, as was shown in the preceding lesson (Fig. 40), flows through the crossed wire to the point F.

When a wire chief finds it impracticable to connect battery to the end of the second crossed wire, he generally requests some station beyond the fault to ground the second crossed wire, and the battery is then grounded at the testing station (Fig. 43).

In this case the earth serves the same purpose of providing a path for the battery to the loop by way of the fault as shown in Fig. 42, the path of the current being indicated by the dotted line in Fig. 43.

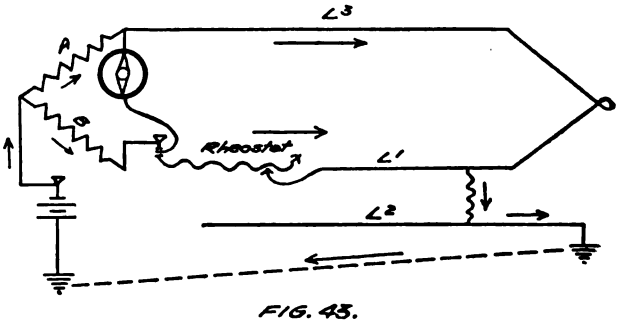

FIG. 43.

The formula for this test is the same as that described in Lesson 19, which consists of the simple equation

$$F = \frac{L - V}{2}$$

in which F is the resistance to the fault, L the resistance of the loop and V the Varley measurement.

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Measurement for Crosses Using Two Crossed Wires

A study of Figs. 42 and 43 will indicate to the student that the resistance of the cross between the two wires can be neglected so long as the current entering the loop is of sufficient strength to sensibly deflect the galvanometer needle on an unbalanced condition of one or two ohms. In that case it does not matter whether the resistance involved be one or one thousand ohms, so far as affecting the result is concerned.

It is this fact which makes a measurement of this character so much more desirable and preferable to that of a simple resistance measurement through the cross.

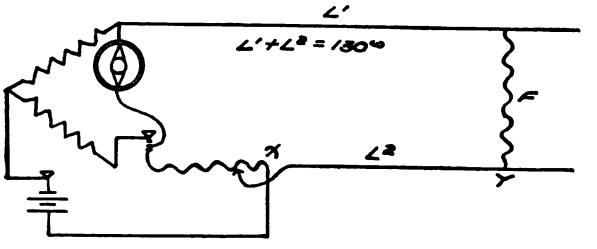

FIG. 44.

FIG. 44

A reasonably reliable location of the trouble can be made by means of tests outlined in Figs. 44 and 45. In these tests the resistance of the fault is taken into account and so long as it does not vary between the two tests, it will not alter the result.

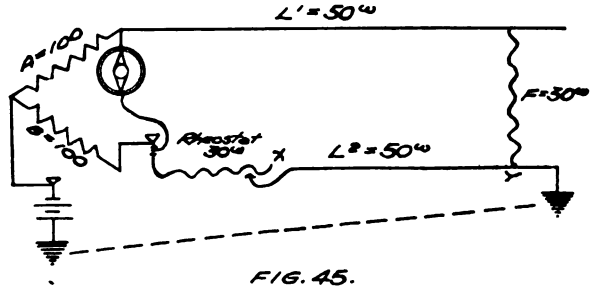

FIG. 45.

The formula governing this test is the same as that applied to all the other tests herein shown.

The explanation of the test as per Figs. 44 and 45 is as follows: The resistance necessary in the rheostat to establish a balance in Fig. 45 simply makes the point Y the apex of two sides of the loop formed of the two wires through the fault F. It is plain, then, that to deduct this resistance from the loop measurement of Fig. 44 and then halve the result gives the resistance to the point Y.

Referring again to Fig. 44 we observe that the loop balance of L^1 and L^2 through the fault F is obtained with 130 ohms, and in Fig. 45 a balance is secured with 30; then $130 - 30 = 100$, and this, divided by 2, gives us 50 ohms as the resistance of X to Y. We are assuming that the wires are of the same gauge and kind; from which, then, it follows that 50 ohms is also the resistance of L^1, which leaves us 30 ohms for the fault itself. Then 30 ohms (the fault resistance) plus 50 ohms on one side of Y equals 30 ohms (in the rheostat) plus 50 ohms on the other side, proving that this calculation is correct.

As will be noticed in referring to Fig. 45, some convenient station beyond the fault F has the wire L^2 grounded.

(To be continued)

Every Telegrapher Should Have a Knowledge of Phillips' Code

Phillips' Code (*New Edition*). A thoroughly tested code of abbreviations arranged for telegraphic purposes and contemplating the rapid transmission of press reports; also widely used as an easily acquired method of shorthand. Revised and brought up to date, with supplement to February, 1920, by E. E. Bruckner, one of the most expert press code telegraphers in the country. The new edition contains about 700 additions to the older code, and is indispensable to the telegrapher who would become a *finished* telegrapher. Mr. Milton Garges, Chief of the Traffic Dept., Associated Press, New York City, in a recent announcement, following the abandonment of experimental operation of printer service between New York and Washington, said: "One way telegraphers can help themselves is by helping to develop Morse men." The standard of proficiency required by press associations includes a knowledge of Phillips' Code. Flexible cover, vest pocket size, $1.25 per copy. Address and make remittances to Telegraph and Telephone Age, 253 Broadway, New York.

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Future of the Cables

The London *Times*, dated December 21, 1920, contains the following article prepared by Sir Charles Bright, F.R.S.E., M.Inst.C.E., F.R.A.S., M.I.E.E., of London, on the "Future of the Cables." Sir Charles Bright has taken part in many cable-laying expeditions; was a delegate to the International Radio-Telegraph Conference in 1912, and has written largely on Imperial and international communications. He says:

Probably no telegraph conference has ever been the subject of such acute disagreement on essential points as that which has been holding sittings for some two months at Washington. This was perhaps natural, when we remember (1) that over the war Germany has been relieved of nearly all her cables; (2) that the destiny of these cables was of first-rate importance to practically all the principal powers. Everything pointed, indeed, to marked dissension—a dissension which became accentuated by the various conflicting interests of the different nations concerned.

The first, and perhaps the most important, of the German cable links to be confiscated were those connecting Emden with New York, via the Azores. These were interrupted by British hands within five hours after the declaration of war. Subsequently one was taken into Penzance at our end and Halifax at the Canadian terminus. This arrangement did not suit the United States, our American cousins desiring to have cable communication with Germany once more restored. Seeing that one of the Atlantic lines—since 1912 under American control—is being turned over to the British Government, Great Britain has readily acceded to America's desires in this matter, though the cable about to be acquired is even of considerably greater antiquity than the line handed over to America.

The other German Atlantic cable was handed over to France and taken to Brest. The United States propose that this line should be divided between that country and Italy, and diverted from the Azores to Genoa, so as to establish more direct cable communication betwen America and Italy. This is an arrangement which naturally commends itself to Italy. It does not, however, fall in with French views.

Another bone of contention relates to cable communication between the Island of Guam, in the Pacific, and Shanghai, via Yap. During the war the Japanese laid hold of Yap, previously a German island, and desire to maintain control of all cable communication therefrom. That does not suit the American Government, which alleges that it may involve being cut off from China in the matter of cable communication, a state of things not readily contemplated by the United States.

Conflicting Plans

Soon after the confiscation of the German cables an agreement was entered into between the four Allied Powers, Great Britain, France, Italy, and Japan, whereby these ex-German lines were to be severally distributed among them. The United States having, some time later, come into the war, they proposed, over the present conference, that these cables should, as a substituted arrangement, become the joint property of the five Allies.

Thus two conflicting plans are involved. Great Britain and Italy have readily fallen in with the United States' proposal. On the other hand, France and Japan have joined forces in clinging to the original agreement. France, in fact, appears even to suggest that the United States should have little, if any, claim in the matter, seeing that they (the United Sates) only came into the war subsequently. A deadlock has now been reached, and the delegates are consulting their respective Governments.

It should be noted that at the present time the control of the ex-German cables stands as follows: France, some 9,000 miles; Great Britain, 5,000; Japan, 1,000. Could that possibly be regarded as satisfactory to a nation in the position of the United States of America?

Ordinary International Telegraph Conferences have in the past been held at five-year intervals as a rule, in turn at London, Paris, Berlin, St. Petersburg, Vienna, Rome, Madrid, Lisbon, etc. This is the first time that one, including the United States, has taken place at Washington, it being especially concerned with the disposal of the ex-German cables.

International telegraph conventions have been no doubt rightly regarded as steps forward in the advance of civilization. In effect they tend to mitigate in some measure the horrors of war, laws and regulations being arrived at between the powers during the various conferences. But these international conventions and laws have received a severe shock, far harder than could have been expected, during the recent conflict.

In actual fact, Article 15 of the Paris International Submarine Cable Convention of 1884 serves to show that the convention for the protection of submarine cables does not at all bindingly apply to a state of war. It, indeed, indicates the right of belligerents to interrupt all telegraph lines, even those that land on neutral soil. It comes to this, that any cable that conveys intelligence may at any moment be cut by that belligerent (1). The question of the treatment of submarine cables in times of war has, indeed, always been left in perilous obscurity.

In one of the earliest messages which passed through the first Atlantic cable, sent by Mr. Buchanan, President of the United States of America, to Queen Victoria, the following hope is expressed: "Will not all nations of Christendom spontaneously unite in the declaration that it shall be for ever neutral, and that its communications shall be held sacred in passing to their places of destination, even in the midst of hostilities?" More than 60 years have elapsed since that message was sent. During this time cable after cable has been laid; but, in spite of several international attempts to assure the neutrality of submarine cables in war time, no real agreement has yet been concluded.

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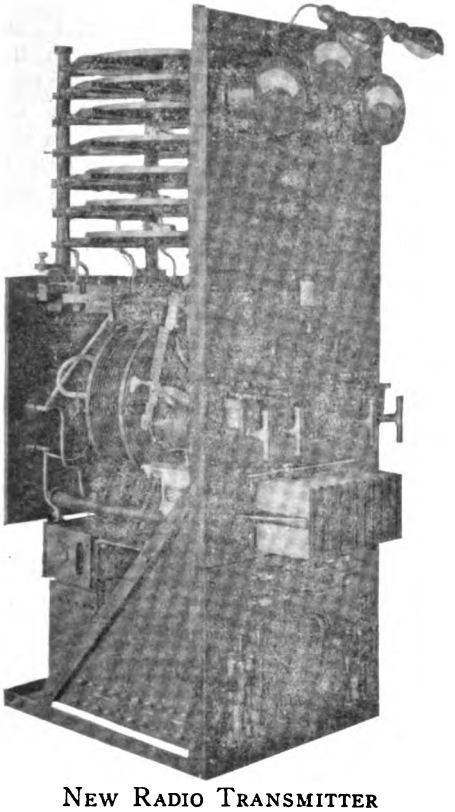
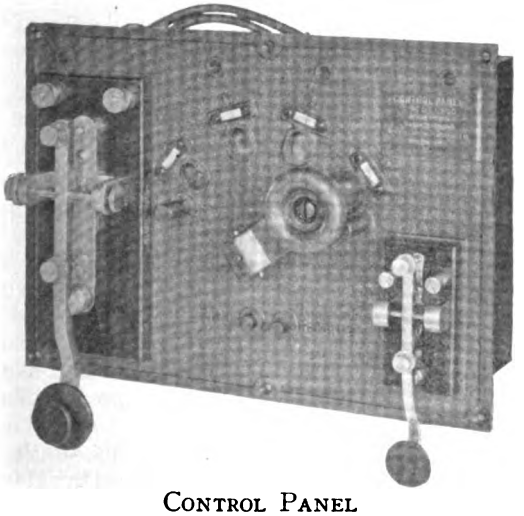
New Type Radio Transmitter

The development of a new type radio transmitter which has just recently been completed represents an advance in radio transmitter design. The striking feature of the equipment is the Priess-Barth magnetic wave changer, which permits remote control of the transmitter and allows the operator to shift instantaneously to any one of four different wave lengths.



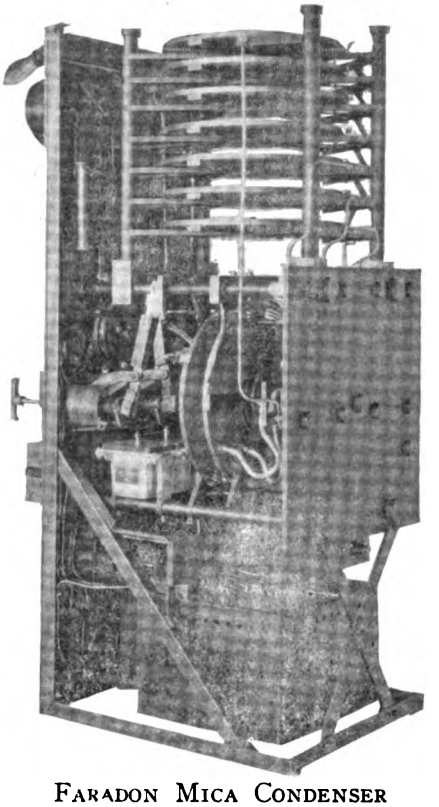
NEW RADIO TRANSMITTER

The transmitter can be adjusted for any four wave lengths up to 2,000 metres. Complete control



CONTROL PANEL

is obtained by a small desk panel. This panel controls wave changing mechanism, starts and stops the motor generator, or permits continuous running of the machine, as the operator desires, operates the magnetic antennae transfer switch and is equipped with small and large keys for current through a relay key or direct. This transmitter requires no more space than present designs now in use, and in several instances requires considerably less space.



FARADON MICA CONDENSER

The time required to shift from one wave length to another is approximately one-quarter of a second, so for all practical purposes this shift is instantaneous. It is believed that the use of this transmitter in commercial work will greatly speed up the handling of traffic.

This new type of radio transmitter was designed by the Wireless Specialty Apparatus Company of Boston.

———o———

Doctor Alexander Graham Bell

We do not forget that others have done much to develop and perfect his revolutionizing invention, but in Dr. Alexander Graham Bell's brain germinated the idea of electric transmission of speech, and he rested not, nor became discouraged until he had made it an accomplished fact.

Thomas A. Watson, who did the mechanical work under Mr. Bell's direction, says that first long distance conversation was from Boston to Cambridge, this great distance being about two miles, and that it was opened by Mr. Bell shouting "Ahoy!" into the transmitter at his end of the long-distance line. It was a great feat and attracted international attention, but recently Tetrazinni, in a room in a New York hotel, sent her golden voice ahoying over the waters to the delighted jackies on battleships hundreds of miles at sea, and no one marveled.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

B. E. SUNNY, president of the Chicago Telephone Company, now the Illinois Bell Telephone Company, recently gave a luncheon to three hundred and seventy-two employees.

R. TEVIS of Kentucky, an old-time telegrapher and inventor, is in New York in the interest of some of his patents.

JOHN R. SCOTT, a well-known Southern telegrapher in the cotton brokerage business, with headquarters at Charlotte, N. C., was a New York City visitor on January 15th. Mr. Scott made his visit the occasion to call on many of his old friends.

E. W. H. COGLEY, manager of the Lewistown, Pa., office, was a New York visitor last wek. Mr. Cogley was well known to the profession thirty years ago. He occupied many prominent positions in telegraph circles during his active career, including the superintendency of the leased lines of the Associated Press, New York.

POSTAL TELEGRAPH-CABLE COMPANY

For upwards of twenty years the telegraph line between Williams and the Grand Canyon, Arizona, a distance of sixty-four miles, has been operated by the Postal Telegraph-Cable Company, whereas all the other telegraph lines under the Santa Fe Railroad are operated under a contract with the Western Union Telegraph Company.

The situation resulted in embarrassment to the railroad people, and in order that this small piece of line might become a part of the general system, the Postal Company sold its ownership in the line to the Santa Fe Railroad, and it has been turned over to the Western Union to operate as a part of the Santa Fe System's wires.

J. J. WHALEN, traffic manager, and E. P. Tully, assistant to the general manager, have not as yet returned to New York, both continuing on inspection trip in connection with traffic and service.

F. F. NORTON, of the general operating department, is also visiting various offices in the West in connection with traffic matters.

H. D. REYNOLDS, superintendent, Buffalo, N. Y., was a recent executive office visitor.

D. H. GAGE, division engineer, eastern division, has returned from a trip, having visited offices at Pittsburgh, Buffalo, Erie and Rochester.

It will be interesting to note that P. A. Hickey, manager of the financial district of this company, with headquarters at 20 Broad Street, New York, was born within a few blocks of his office. He entered the service of the Postal as a messenger boy and he has been manager of the branch offices in the cotton, grain, clothing, theatrical and financial districts.

E. L. MARTIN of New York has been appointed manager of the Montgomery, Ala., office, vice A. L. Livingston, transferred to Birmingham, Ala.

MANAGERS APPOINTED: M. M. Jenkins, Bennettsville, S. C.; Lois T. Hightower, Tuskegee, Ala.; W. N. Crosby, Laramie, Wyo.; E. M. Caulder, Cheraw, S. C.; G. L. PreFontaine, Fond du Lac, Wis.; J. C. Purches, Erie, Pa.; B. Washburn, Columbus, Neb.; Charlotte Hollister, Grants Pass, Ore.; Ralph W. Tatum, San Pedro, Cal.; and Red Smith, Grand Island, Neb.

ALBERT KLEIN, formerly chief operator of the Birmingham, Ala., office, after a month's leave of absence will assume the management of the Jackson, Miss., office.

New York Operating Department

MISS FANNIE E. FERRELL of City 3, and George Harsfall, of the all night force, were married recently.

THE SYMPATHY of the operating force is extended to Miss C. Walsh in the death of her mother.

T. V. FLYNN, quad chief of the day force, has taken advantage of the present good weather and is on his vacation.

H. V. ST. CLAIR, one of the old-time telegraphers of this office, was found dead in bed on January 11th.

Philadelphia Postal Notes

ROBERT C. MECREDY, aged sixty-five years, manager of the Commercial Exchange Office, Philadelphia, for twenty-five years, died of pneumonia on January 16th. Bob Mecredy was well known throughout the entire country, and his death will be mourned by a large circle of friends. He was born in Dublin, Ireland, and learned the telegraph service at Blenheim, New Zealand, where he was a messenger. He became an operator and his first office was at London, Ontario, in 1870. He soon

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became one of the most proficient operators. Mr. Mecredy's travels had taken him completely around the world, an experience which rarely falls to the lot of telegraphers. He had worked for the Western Union Telegraph Company in the principal cities of the Union before engaging with this company, over thirty-five years ago. His record in telegraph tournaments credit him with having sent two hundred and forty-nine words in five minutes, perfect sending. He took part in many of the national conventions and presidential inaugurations. Mr. Mecredy at one time represented his Ward in the Common Council of Philadelphia, and he made a splendid record in that chamber. The Postal Company loses one of its oldest and best managers in the death of Mr. Mecredy, who is survived by his wife, two daughters and one son.

JAMES L. CHAPPLE, of the Washington operating room, has been promoted from the position of day operator on the Birmingham bonus circuit, to that of all-night wire chief.

MRS. W. C. WEAVER, manager at Seaford, Del., has resigned and is succeeded by Miss Marion Ford.

Pittsburgh, Pa.

FRANK L. BENDER, wire chief, is absent on sick leave.

ASSISTANT QUAD CHIEF LOUDER has been obliged to leave Pittsburgh on account of climatic conditions, and has gone to Reno, Nev., as assistant quad chief.

The clothing of the grandmother of Miss Anna McCauley, operator in our main office, recently caught fire, and Miss McCauley was very severely burned while extinguishing the flames. She is confined to her bed as a result.

WESTERN UNION TELEGRAPH CO.

Western Union Employees' Association Agreements

A Conference Committee appointed by the President of the Western Union Employees' Association, concluded its ten days' conference with Western Union officials in New York, January 22nd. Several agreements were made with the different departments of the telegraph company, all of which were considered satisfactory to both sides. One of the agreements reached was, whereby members of the Association would be given preference in promotions. The income participation plan was renewed covering the year 1921. The Association will hereafter have a representative on the Rating Committee. It was also decided that all vacancies below that of chief operator, manager and district foreman are to be bulletined, seniority to govern. It was decided to appoint a joint committee of company officials and representatives of the Association to make a study of the proposed classification schedule.

It is the purpose of this company to erect six additional transcontinental copper wires connecting the Eastern cities with the Pacific coast cities. The expense involved will be about $2,000,000. It will require about 4,000,000 pounds of copper wire and hundreds of tons of glass insulators to complete the work.

I. D. HOUGH, division traffic engineer, eastern division, New York, has been appointed assistant division traffic superintendent in charge of the Metropolitan Division.

B. H. Heathcock, division traffic inspector, has been promoted to division traffic supervisor of the mountain division, Denver, Colo.

Western Union—Eastern Division

B. J. CARROLL, chief bookkeeper, Baltimore, Md., has been transferred to Washington, D. C., vice A. G. Foden, transferred to the office of the comptroller, New York.

S. GRAY, manager, Shreveport, La., has been transferred to the managership at Franklin, Pa.

G. P. MUNSON, manager, Herkimer, N. Y., died on January 15.

New York Western Union

MISS JULIA REICHERT died January 8th. Interment Evergreen Cemetery.

CHARLES J. RILEY of the testing and regulating department died suddenly January 15th. Interment was at Maspeth, L. I.

THE baseball fans can now go ahead with their schedule and details, as Edson S. Brewster has returned from his vacation.

MISS ETHEL CARVER set the Commercial News Department buzzing on the announcement of her wedding, January 25th. She is now Mrs. George Jorgenson.

W. J. DERMODY, manager of the Ogden, Utah, office, recently made an address at the weekly luncheon of the Progressive Business Club of that city, on "The Progress of the Telegraph in Relation to the Business of Ogden." Mr. Dermody has been manager at Ogden for over thirty years.

SAMUEL W. REESE, aged seventy-eight years, a veteran telegrapher of the Civil War, and manager for over fifty years of the Western Union Telegraph Company at Cleveland, Tenn., until seven years ago, when he retired from active service, died at that place on January 10th.

Hamlet E. Rawson, chief operator of the Western Union Telegraph Company at Columbus, Ohio, since 1902, died on January 24th. Mr. Rawson was sixty years of age and had been identified with the Columbus office since 1880.

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Radio Telegraphy

Radio Corporation of America

E. J. NALLY, president, sailed for England on the steamer *Imperator*, January 20, on a brief business trip.

THE FIRST annual staff dinner of the traffic department was held in the Egyptian room at Murray's, on West 42nd Street, January 22nd, covers being laid for fifty guests. Addresses were made by the chairman, Harry Chadwick, superintendent; W. A. Winterbottom, traffic manager, and David Sarnoff, commercial manager. The affair was a great success and was followed by a theatre party. A wireless message was sent to President Nally on the *Imperator* expressing regret at his absence.

DAVID SARNOFF, commercial manager, is receiving congratulations on the birth of a son January 9.

Radio Links France With United States

On January 18th the Radio Corporation of America announced the opening of its new radio service to France, thereby adding another link to its world-wide wireless chain. The service is a direct one, and is intended for commercial communication between the United States and France.

This new radio service is being accomplished through the huge transmitting station located at Tuckerton, N. J., which makes use of a 200-kilowatt Alexanderson alternator of the high frequency type, a comparatively new invention developed by the General Electric Company, which has well-nigh revolutionized the art of wireless communication.

The receiving station on the American side is at Belmar, N. J., while on the French side the receiving station is located at Villejuif, a small town near Paris. The transmitter on the European side is at Lyons, France.

"The bonds of social and commercial understanding which have existed betwen these two countries for centuries are now firmly cemented by the modern science of radio communication," said President Edward J. Nally recently, shortly after the sending of official messages of congratulation exchanged between himself and French officials.

The Marconi Wireless Telegraph Company of Canada, Ltd.

LIEUTENANT R. V. RIDGES, R.N.C.V.R., M.B.E., who was fleet wireless officer at Halifax during the late war, has joined the engineering staff, and is now stationed at headquarters, Montreal.

J. W. MULLIN, engineer-in-charge of Glace Bay station, was a visitor at head office on the twelfth instant, en route to Glace Bay after having spent the holidays at his home in Ontario.

IN DECEMBER last a press service to ships at sea was inaugurated from a new 6 K.W. valve station at Glace Bay, N. S. This service specializes in Canadian news and fills a long felt want in the Canadian North Atlantic passenger service.

THE Independent Wireless Telegraph Company issues a sixty-page book of instructions to its operators which is an exceedingly interesting compilation of useful information to wireless people. It covers the duties of an operator in all details and the book has been prepared with the utmost care. The executive offices of the company are located at 42 Broadway, New York.

Pacific Coast Talk is Heard in Spain

An account of a remarkable wireless telephone conversation, extending on January 19th from Avalon, Catalina Island, in the Pacific, across the continent and over the Atlantic to Spain and Portugal, has appeared in public prints.

National Electrical Code

The National Fire Protection Association has submitted its "Regulations of the National Board of Fire Underwriters for Electric Wiring and Apparatus," edition of 1920, frequently referred to as the "National Electrical Code," to the American Engineering Standards Committee for approval as an "American Standard."

This Code is submitted in accordance with the special provision in the procedure of the Committee, under which important codes in existence prior to 1920 may be approved without going through the regular process followed in new work.

The book contains 216 pages, and it may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York. Price 25 cents per copy.

The Western Union Telegraph Co., Inc.

The earnings report of the Western Union Telegraph Company for the twelve months ended December 31, 1920 (month of December estimated), is as follows: Gross revenues, including dividends and interest, $122,357,437.00; maintenance, repairs and reserved for depreciation, $16,477,403.00; other operating expense, including rent of leased lines, taxes and employees' income participation, $91,763,-434.00; total expenses, $108,240,837.00; balance, $14,116,600.00; deduct interest on bonded debt, $1,-331,850.00; net income, $12,784,750.00.

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The Island of Yap Now a Disturbing Factor

The Island of Yap loomed big in Washington, D. C., on January 25th, not only as a disturbing element between the United States and Japan, but between this country and all the Allied Powers, when Under Secretary of State Davis appeared before the Senate Foreign Relations Committee and presented all available details concerning the Yap situation. He produced the minutes of the Council of Five at Paris, which showed that the island had been assigned formally to Japan despite the protestations and reservations of President Wilson.

According to the minutes presented by Mr. Davis, Yap and the other North Pacific islands belonging to Germany were finally and specifically assigned to Japan at a meeting held May 7, 1919. The President did not attend that session.

While some members of the Foreign Relations Committee take a gloomy view of the situation and believe the President lost the Island of Yap when the notation of May 7 was made, others insist the matter is not closed and must be settled hereafter.

President Wilson, in making his reservation, asserted that the United States was not willing that Yap should go to any power, but should be available for the use of all nations as a cable base. None of the powers objected to the position the President took.

It later developed that while there was no specific agreement embodying President Wilson's suggestions and reservations, some of the powers understood that when the mandate was given to Japan over the islands north of the equator in the Pacific formerly owned by Germany Yap was included. President Wilson, it is asserted officially, did not so understand and for that reason the United States does not now recognize Japan's mandate over Yap.

It has been the position of President Wilson and the State Department, in reference to the pledge given by the British Ambassador, that no special agreements entered into between the powers concerning which this Government was not consulted, and purporting to dispose of enemy territories, can be deemed valid and binding, as the right to dispose of such territories was derived from the victory over Germany, a victory which was gained by substantial aid from the United States.

The British Government is inclined, it is learned authoritatively, to hold itself bound by the exchange of promises with Japan respecting the disposition of the German islands in the Pacific, and would likely support Japan if the latter should desire to hold England to the letter of the promise.

Mr. Davis, who is chairman of the International Communications Conference, has been waiting for the representatives of the other principal powers to complete exchanges with their governments on matters submitted for their consideration by the United States before calling the conference together. It was said by Mr. Davis that the conference should be called soon.

All America Cables

JOHN L. MERRILL, president of this company, left New York on January 21st, for a trip to Galveston, New Orleans, and the Panama Canal. The primary object of the trip is to make an inspection of the company's property at Galveston and on the Isthmus. Mr. Merrill was accompanied by his wife and his private secretary.

DURING the absence of President Merrill, Vice-President McLaren is acting President.

C. V. LAWRENCE, superintendent of land lines, Buenos Aires, Argentine, who has been in the United States for the past two months, sailed for home from New York on January 26th.

N. J. PERRYMAN has been appointed superintendent of apparatus and equipment with headquarters at New York.

ALFRED COOPER has been appointed manager at Colon, Isthmus of Panama.

SUPERINTENDENT A. S. BAKER, who has been in Europe, has returned to Lima, Peru.

H. B. CALDER, who has been on vacation, has returned to Antafagasta, Chile.

F. W. PHELAN, J. B. SMITH and W. A. EAGAN left New York for a business trip to all the company's offices in Central and South America.

Joseph P. Hayes, president, and James G. Hayes, secretary and treasurer of the Western Union Employees' Association, with headquarters in Chicago, were New York business visitors for the past two weeks.

Institute of Radio Engineers

The annual election of officers recently held by the Institute of Radio Engineers resulted in the election of E. F. W. Alexanderson, president; Fulton Cutting, vice-president; A. N. Goldsmith, secretary, and W. F. Hubley, treasurer. The Board of Direction of the Institute is made up of the officers and the following managers: E. H. Armstrong, W. H. G. Bullard, E. H. Colpitts, L. Espenschied, J. V. L. Hogan, L. R. Krumm, R. H. Marriott, Donald McNicol and George O. Squier.

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Canadian Telegraph Items

Canadian National Telegraphs

G. H. WALTERS has been appointed district commercial superintendent, and not district traffic superintendent, as previously reported.

THE DISTRICT traffic, commercial and plant superintendents and superintendents of railway service, were called in conference to the general offices at Toronto, on New Year's Day, when the various features of the new management were outlined.

THE FOLLOWING service changes are reported from the Montreal District: D. McWilliams appointed manager at Quebec City, vice G. C. Vaudrin, transferred; Miss W. M. Whitman, appointed manager at Berlin, N. B., vice Miss D. J. Oleson, resigned; G. A. L. Wilkes of Moncton, N. B., appointed manager at Bathurst, N. B., and Miss B. Morrin, manager, Brockville, Ont., has resumed charge after an absence of two months due to illness.

THE FOLLOWING are recent appointments of chief operators: W. J. Pitfield, Toronto, Ont.; H. C. Milne, Winnipeg, Man.; R. Carmichael, Edmonton, Alta; J. R. Rochon, Port Arthur, Ont., and S. A. Matthews, Capreol, Ont.

W. G. BARBER, who was recently promoted from the position of district commercial superintendent to be general commercial superintendent of the system, was pleasantly surprised the day before Christmas by being made the recipient of a handsome gold watch and chain and gold penknife on behalf of the managers at the larger Ontario offices.

THE RESCUE of the three United States Naval balloonists, who landed near Moose Factory on James Bay, December 14th, after drifting from Rockaway, N. Y., caused quite a sensation in press and telegraph circles. Representatives of the various press associations throughout Canada and the United States, with a welcome party, awaited the arrival of the balloonists at Mattice, with a special train provided by the Canadian National Railways. Officials of the telegraph department stationed at strategic points along the line supervised the movement of press despatches. G. T. Trowhill at Cochrane and G. H. Walters at Quebec, looked after the wire service, while E. Kenward, R. M. McMillan, B. S. Round and J. Sullivan remained with the special train. On the occasion of the party leaving Mattice for Toronto, on January 12th, the following telegram was despatched to George D. Perry, general manager, Toronto: "Staff correspondents of newspapers in the United States and Canada covering the return of the Navy balloonists to Mattice, want to thank your company for the efficient telegraph service provided in this emergency and to express their appreciation of the splendid fashion in which this unusual and unforeseen business was handled."

E. L. Scott has been appointed Superintendent of traffic on western lines, Canadian Pacific Railway Company's Telegraphs, with headquarters at Winnipeg, succeeding J. Fletcher, who has retired.

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State Control

This telephone business adequately shows us, says the London *Mirror*, what bureaucratic control can do to make of a big public telephone service, not so much a service, as a nuisance; how it can reduce efficiency and increase expense; how it can deprive the public of the right to influence the administration of a need of daily life; in fact, how essentially undemocratic State control can be.

We, the public, take our orders from the bureaucrats. And, if we protest, we are told, first, that we are "ignorant and irresponsible"; and then that the bureaucracy cannot manage in any other way. Positively the thing can't be helped!

Now, a private firm does not dare to say that; because a private firm has to please its patrons as a condition of its existence.

We do not wonder, then, that people are everywhere asking, as the Leeds Telephone and Telegraph Advisory Committee has just asked, that those who have muddled the telephone should give it up, and give it back to those who would not be able to afford to muddle it.

"Government control," the West Riding Committee says, "produces inertia fatal to any service." And they suggest that the service be placed "under the management of some public or private body whose administration is likely to remove the grounds of complaint referred to in the Select Committee's report of the inefficient and unbusinesslike method of the present service."

Other important bodies throughout the land have spoken in the same sense. All agree that no private firm would have ventured to treat the public so badly.

—o—

The Ward Leonard Electric Company, a pioneer in the development of control apparatus for electrical equipment, such as motors, batteries, wireless outfits and searchlamps, showed a few of its marine specialties at the National Marine Exposition. One of the interesting features of the exhibit was a complete battery charging outfit installed in such a way as to permit demonstration of the various conditions that may be met in practice, such as overload, under-load, and no-voltage. By providing means for producing these conditions, it is possible to illustrate the performance of the equipment and to demonstrate its action in protecting the battery and charging circuits.

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No. 4 NEW YORK, FEBRUARY 16, 1921 Thirty-ninth Year

CONTENTS

Recent Attainments in Wired Radio. By R. D. Duncan, Jr..... 74
Recent Attainments (Continued) 75
Military Telegraph Pension Measure. By Frank A. Stumm. Regret French Wire Delay. Telegraph and Telephone Life Insurance Association Assessments. The Electrical Aid Society of Philadelphia. 76
Horace L. Hotchkiss Honored. Telephone Connecting Cuba and the United States 77
Loyalty. Telegraphing Photographs by Code 78
The Alexanderson High Frequency Alternator. By E. Blake..... 79
Students' Course in Technical Telegraphy. By Louis Casper. Lesson 21 80
Students' Course (Continued) 81
Editorial Comment—The Enjoyment of Knowledge. Bandits Rob Telegraph Offices. The Edison Medal. Mr. Edison's 74th Birthday. Orders Western Union Poles From Right of Way..... 82
Semi-Automatic Sending Keys 83
Life Insurance Association for Telegraphers 84
The Railroad—Telegraph and Telephone Section of the American Railway Association. Radio for Railroad Work..... 87
Industrial. Obituary. Radio Telegraphy 88
Message by President-Elect Harding for Radio Competition. Radio Corporation of America. The Cable..... 89
Good-Bye, My Pal, "Fahey's Famous Fables"..... 90
Current Events. Personal. Postal Telegraph-Cable Company..... 91
Western Union Telegraph Company 92
Western Union Telegraph Company (Continued) 93
Canadian Telegraph Items—Death of A. B. Smith. Ernest W. Clayton. 94
Montreal Telegraph Company's Annual Meeting. Telegraph Tax Ruling 95
Misunderstanding of Orders. Death of S. L. Burts. Death of Frank A. Pickernell 96

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Recent Attainments in Wired Radio*[1]

By R. D. Duncan, Jr.,

Radio Engineer Signal Corps, U. S. Army, in the Journal of the Franklin Institute.

1. Introduction

Publications in the recent technical press have revealed that the problem of "Wired Radio" has aroused widespread interest within the last few years, both in this country and abroad, and in its many practical and theoretical phases has been the subject of extensive study and investigation.

The publication in 1911 by Major (now Major-General) George O. Squier, of a paper on "Multiplex Telephony and Telegraphy,"[2] marked an epoch in the scientific progress of the telephone and telegraph art. Though the problem of multiplex telephony and telegraphy had engaged the attention of a number of inventors prior to General Squier's work, the ideas underlying the schemes which hitherto had been proposed were based, almost without exception, upon the principles and practices of the old telephone art. The great advance made by General Squier, and that which made the use of high (radio) frequency carrier currents successful, was the combined utilization of tuned circuits, and a detector or rectifier at the receiving terminus. By this achievement the principles common to the radio art were made available to the older wire systems and a new method of transmission of intelligence was created.

The utility of wired radio was early realized in this country by certain of the telephone and telegraph companies, and its practical development in the realm of low frequency carrier currents has been carried to an advanced and commercial stage; long-distance telephone and telegraph lines employing the system are in daily operation between a number of large cities. That this country is not alone in the development of this new art is evidenced by the publications of Wagner,[3] Faszbender and Habann,[4] in Germany, and by Marumbo[5] in Japan. The two former papers contain interesting accounts of the development of wired radio apparatus in Germany during the war; the latter paper, though quite brief, is also of great interest, as it contains descriptions of methods and apparatus used where a high voltage power line was employed for transmission means.

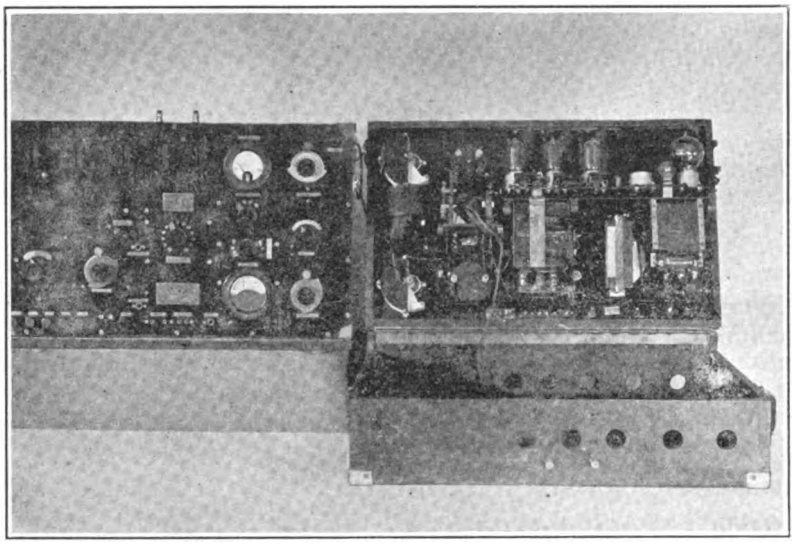

Fig. 1

II. Preliminary Experiments

The practical development of wired radio was not pushed vigorously during the war by the Signal Corps, U. S. Army, as military requirements demanded apparatus of a more purely radio nature. A limited number of field telegraph sets operating on low frequencies were developed and manufactured. In an attempt to find use for a large quantity of radio telephone apparatus which had been purchased during the war, and which was then idle, experiments were commenced in the early part of 1919 with a view to investigating the possibilities of adapting this apparatus to wired radio communication. A brief account of these preliminary experiments has already been published.

In the experiments described, it was originally intended to employ frequencies of the order of 75,000 cycles per second for carrier purposes, since in com-

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*Communicated by Major-General George Owen Squier, Chief Signal Officer, U. S. A., Member of the Institute, Associate Editor.

[1]"Wired Radio" refers to the use of high frequency currents guided by wires.

[2]*Trans. A. I. E. E.*, Vol. 30, 2nd Part, p. 1617, 1911.

[3]Wagner: *Telegraphen u-Fernsprech Technik*, No. 3, p. 29, June, 1919.

[4]Faszbender and Habann: *Jahrb. d. draht. Tel. und Tel.*, Band 14, p. 451, October, 1919.

[5]Marumbo: *Proc. I. R. E.*, Vol. 8, No. 3, p. 199, June, 1920.

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mon with the prevailing opinion it was believed that the excessive values of attenuation which, it was thought, must occur at the high frequencies, would be prohibitive of transmission over anything but the very shortest distances. Accordingly, efforts were first directed toward altering the constants of the transmitting apparatus so that frequencies of this order of magnitude could be obtained. However, the radio telephone apparatus which was to be employed was originally designed for operation at high frequencies (short wave-lengths) and on relatively small antenna capacities; from experiment it was found that if the original intention of using low frequencies was adhered to, a considerable change in the construction of the apparatus would be required. As a consequence it was decided to abandon the low frequency idea and to utilize, what had heretofore been considered the extremely high frequencies, as a carrier means.

One distinct advantage which was anticipated and which does result from the use of very high carrier frequencies is the elimination of speech distortion so common to long-distance wire telephony. In accordance with radio telephonic theory, three frequencies will be present in load circuit (antenna or telephone lines), if the modulating frequency contains no harmonics, *viz.*, respectively, the main carrier frequency, and the sum and the difference of the main carrier frequency and the modulating frequency. If harmonics are present in the modulating frequency, then in addition to the three main frequencies, there will be additional frequencies corresponding to the sums and differences of the main frequency and each of the harmonics. Assuming that the fundamental frequency of the voice is 800 cycles per second, and the limiting harmonic to be 3000 cycles per second, it is readily seen that at high carrier frequencies, the band of frequencies which is transmitted, is so small a percentage of the main carrier frequency that the attenuation to all frequencies within the band is practically the same. The elimination of speech distortion due to this cause thus automatically results.

Views of the transmitting and receiving apparatus employed in the experiments are shown in Fig. 1; a diagram of connections of the circuit is given in Fig. 2.

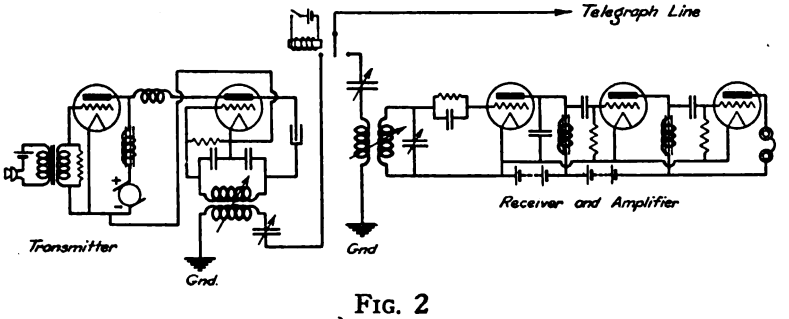

FIG. 2

The experiments were conducted on a wire belonging to the Postal Telegraph Company, running between Washington and Baltimore, a distance of 66 wire miles (106 Km.). The line was aerial throughout the distance of transmission and contained a single section of overhead cable approximately one-quarter of a mile in length; in the experiments the transmitting and receiving apparatus was connected between the line and the ground. The carrier frequency employed was 600,000 cycles per second. Throughout the entire tests the line was in ordinary duplex telegraph operation; no interference, either from the ordinary telegraph operation, or from the wired radio, was experienced by either system. The normal range of the apparatus when functioning as a "radio" telephone in communication with similar apparatus, is ten miles; it is seen that by the methods of wired radio, the range of communication was increased many times.

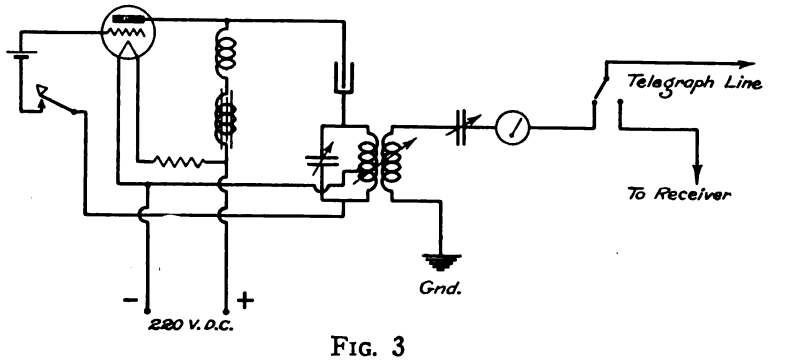

FIG. 3

For telegraph purposes, only a vacuum tube transmitter was developed for operating directly from a 220-volt direct current lighting source. A diagram of connections of the apparatus is shown in Fig. 3.

The results of these preliminary experiments were

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of unusual interest, as it was demonstrated that transmission over relatively great distances could be accomplished with frequencies greatly in excess of the value which had heretofore been taken as the upper limit. From a practical standpoint, a number of questions arose requiring further investigation, of which probably the most important was that of determining the relative parts played by radiation and by true conduction, and of the distances over which satisfactory transmission might be expected to be obtained.

(To be continued)

Military Telegraph Pension Measure

By FRANK A. STUMM.

The contention of the Society of the United States Military Telegraph Corps for a pension status is once more at a climax. The latest hearing was before the House Military Affairs Committee January 13, 1920, on the bill known as H. R. 5815. Our secretary, Mr. D. H. Bates, was spokesman and made such a convincing address that at the close the few members who had opposed our bill became its equally strong friends. The full committee, following suit, reported the bill to the House April 13th recommending that it be passed. It was put on the Unanimous Consent Calendar, but was not called up until January 17, 1921, when its consideration was objected to by Representative Blanton of Texas, and unless that gentleman asks for its reinstatement on the Calendar it cannot be called up again at this session of Congress. It will be re-introduced at the extra session which, it is stated, will be called by President Harding in April.

Regret French Wire Delay

The efforts of the Paris correspondents of American newspapers to obtain better transmission of news dispatches from Paris to New York is having an echo in the French press. For instance, the *Matin* editorially recently said that, instead of complaining about the lack of presentation abroad of the French case in international affairs, government officials would do well to improve the service over the telegraph lines between Paris and the cable heads.

"Events of world importance take place in Paris," says the Matin. "But the dispatches of our American confreres are submitted to nauseating delays. That puts the American journalist in a bad humor and our telegraph service makes them feel like turning their backs on us. From Berlin, press dispatches for America get away in a hurry. Here they do not.

"The wireless station at Bordeaux was made available for American news dispatches. Very good. But unfortunately it is necessary for those dispatches to get to Bordeaux. To traverse the Atlantic takes but a moment. To get from Paris to Bordeaux is an interminable undertaking.

"If we want good propaganda, it is absolutely essential that press dispatches be transmitted more quickly and that they be handled by a better personnel, who shall not boast of their ignorance."

The Electrical Aid Society of Philadelphia

The Electrical Aid Society of Philadelphia held its third annual session on January 19th and re-elected President John A. Chapman, Vice-President George J. Wells, Recording Secretary, W. E. Vanarsdall, Financial Secretary R. C. Murray, Treasurer James H. Wilson, Executive Committee—Frank E. Maize, Andrew S. Weir, Charles F. Meyers, Edward T. Aitken and John C. Smith; Trustees John C. Smith, William S. Stewart and R. H. Conway.

President Chapman, Past Presidents A. S. Weir and Andrew P. Sell made brief addresses on the good of the society. It was decided to hold the usual spring entertainment.

After business was concluded the members were treated to refreshments and dancing.

Herbert's Book on Telegraphy

The Fourth Edition of Herbert's "Telegraphy" was placed on the market in December. The price of this enlarged book of 1,020 pages is $6.50 per copy. This work is a detailed exposition of the telegraph system of the British Government, and has been thoroughly revised as well as enlarged. It not only describes the English telegraph systems, but other systems which are of direct interest to American practice.

The chapter on Secondary Cells or Storage Batteries has been extended and brought up to date. A description of the Kleinschmidt Perforator is also found in this book.

Appendix C on the Gulstad Relay has been rewritten in view of the adoption of this relay on so many long and difficult circuits.

In the Addendum following the Appendix there is an elementary account of the amplifying wave.

The use of small currents to enable telegraph and telephone circuits to be worked in the same cable has far-reaching consequence in the English telegraph practice, and it is fully covered.

A chapter is also devoted to the Vibroplex. Experiments are being made to ascertain whether its adoption lessens the strain on the telegrapher, reduces the liability to "cramp," and increases the output of work.

Those desiring copies of this valuable book should address and make remittances to John B. Taltavall, Publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Telegraph and Telephone Life Insurance Ass'n

Assessments Numbers 691 and 692 have been levied by the Telegraph and Telephone Life Insurance Association, New York, to meet the claims arising from the deaths of John A. Stanfield, Portland, Oregon; John H. Gough, Newark, N. J.; Hubert J. Myers, Constantine, Mich.; Joseph R. L. Gilbert, Philadelphia, Pa.; Albion C. Chatman, Philadelphia, Pa.; William D. Shuster, Philadelphia, Pa.; Amos D. Tiffany, Burlington, Vt., and Mary S. Hubbard, Hartford, Conn.

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Horace L. Hotchkiss Honored

Horace L. Hotchkiss, who introduced the ticker service in New York City and organized the Gold and Stock Telegraph Company in the late sixties, a retired banker, now living at the Hotel Webster, New York, is being congratulated on the arrival of his sixth great-grandchild, who is named Horace L. Hotchkiss 4th. Mr. Hotchkiss, Senior, is well known to many of the older members of the telegraph profession, with which he was so closely identified for many years, and is, naturally, proud of this great event in his life.

His brother, Clark B. Hotchkiss, who died many years ago, was general agent in New York of the Kerite Insulated Wire and Cable Company, in the eighties.

Mr. H. L. Hotchkiss, Sr., has been an enthusiastic golfer since his retirement from business. The *Canadian Golfer* in its issue for January has this to say about Mr. Hotchkiss under the title of "Unto the Third and Fourth Generation":

The following item from the New York *Sun* will be read with especial interest by members of the Canadian Seniors' Golf Association. Mr. Horace L. Hotchkiss, the great-grandfather referred to is the "Father" of the Senior Golfers on this continent, and an honorary member of the Canadian Seniors' Golf Association. He participated in the historical meeting of Canadian Seniors' delegates in New York three years ago, and was at the first Canadian tournament at the Royal Montreal, in September, 1918. The Senior movement in the Dominion owes much to his kindly counsel:

"It may be that some fifty-five years from now the name of one Horace L. Hotchkiss will still remain as head of the United States Seniors' Golf Association. With the recent birth of Horace L. Hotchkiss 4th there are four 'boys' of that name. Mr. Hotchkiss, the honorary president of the Senior body, has for years been a prominent member of the Apawamis Club, at Rye, where the annual gatherings of the S. G. A. are held. His son and grandson also belong to Apawamis.

"This is Mr. Hotchkiss' sixth great-grandchild. It will, therefore, be seen that the new Horace has a great-grandfather, grandfather and father all members of the Rye organization. His grandfather, incidentally, has been a member of the New York Stock Exchange for over thirty years.

"It was sixteen years ago that Mr. Hotchkiss first conceived the idea of a tournament open to Senior Golfers, the age limit at that time being 50. So popular did these meetings become that it was soon necessary to raise the eligibility age to 55 and to make it imperative that every contestant join the United States Seniors' Golf Association.

"All of the tournaments have been held at Rye, the field being so large of later years that one-half the Seniors play the first two days and the other half the two following days. Ever since the S. G. A. was formed, about four years ago, Mr. Hotchkiss has been honorary president. Prior to that he served in an unofficial capacity to his boys, being known as 'father of the Seniors.'"

Telephone Connecting Cuba and the United States

In our issue of January 16th on page forty-one we printed an article under the title of "Telephone Connecting Cuba and the United States," which has attracted considerable interest, not because of the great length of the cable, but because of the unusual depth of water in which the cable has to be laid in connecting the two countries. A description of the cable will, therefore, be of some interest to our readers.

The route which the cables will take from Havana to Key West is approximately one hundred land miles, a greater distance than ever before attempted for submarine telephone communication. The present world's record is held by the cable from Abergeith to Howth, a distance of sixty-three nautical miles.

As the water between Key West and Havana is six thousand feet deep in places, a considerably greater depth than any at which a telephone cable has ever been laid, the engineers agreed that the compression strain would be too great for the usual type of cable. In meeting this difficulty, a type was adopted which never had been used for a longer distance than forty nautical miles, that particular record being held by the cable from Dunkirk to St. Margarets, laid in an emergency by the British Government in the early days of the World War.

The metallic return also was abandoned, and the cables will be grounded at sea, a procedure which might be startling to some engineers, but which was considered advisable in the interests of good service under the peculiar set of circumstances encountered.

The temperature of the tropical waters and the speed of the current that runs around the most southern point of the United States were other elements which had to be considered by the engineers in selecting a set of specifications for the cables. And then came the toredo, a small but dangerous enemy, a boring insect of the sea, which eats through cable armor, insulation and a great variety of other substances. The habits and appetite of the toredo played an important part and added considerably to the cost of constructing the cables.

To make repairs easier and to minimize the dangers of totally interrupted service, it was determined to lay three cables instead of one large one, although water compression constituted additional evidence against a multiple-core cable. As a further protection to continuous service, the cables will lie five miles apart.

The officers of the Cuban-American Telephone and Telegraph Company are:

President, Hernand Behn; first vice-president, Charles D. M. Cole; second vice-president, Sosthenes Behn; secretary, Carlos I. Parraga; treasurer, Manuel Herrera.

In addition to these, the following are directors: Rafael G. Abreu, Jose Marimon, J. Epps Brown, W. S. Gifford, E. K. Hall and Bancroft Gherardi.

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Loyalty

The disloyal includes those who forgot or ignored their duty to a system of which they were among the principal beneficiaries, as well as those who out of mere ignorance have been led off after false gods. Of the two it is easier to forgive the faithfulness of the latter, for theirs was the dissatisfaction that comes out of the grind of existence, out of the weariness of bearing burdens that at best are more of a promise to posterity than anything the bearers ever hope to enjoy. We know, and they are fast learning, that the burdens cannot be put down, that there is no universal rest while life rests, that from the beginning man has lived by the sweat of his brow and that it shall be so to the end. Like faith, loyalty is born of conviction. Men must believe in the thing they serve. To believe in the true it is essential that they have knowledge of the false, or at least it is essential that they know there is a false as well as a true. Truth is not dependent upon dogma, except in so far as dogma arises in the defense of truth; for truth can be arrived at by agreement, so that a thing agreed to as best becomes truth. Any of us could figure out an ideal system of feeding, clothing and housing humanity at a minimum of cost in individual effort, and such systems have been planned many times in the history of the race, but none has ever worked when tried. The explanation of their failure is simple—all too simple. They have invariably started in with an effort to uproot all the ideas, traditions and preconceptions man has developed. Man is more the creature of his ideas than his ideas are his creatures, and that is the simple explanation of the failure of every attempt to establish the ideal. An ideal is a conception manufactured by an individual, or a group, out of thought, a process in which the limitations of the practical are seldom consulted or heeded. Inside the bounds of reason there is no limit to idealism. Anything that can be proved in logic can be established. Idealists do not always hold themselves to the limits of reason; some invade the precinct of fancy and their followers are legion. Voltaire, a frequently practical though cynical man, fancied an El Dorado whose roads were paved with gold and whose houses were roofed with diamonds, and immediately there rose up adventurers who proposed to set out to find the place.

An idea is a growth, a discovery that is based on a fact. It can be felt, handled and worked. It may be a tradition or a steam-engine, but it has something behind it that is rooted in the common experience, or that is demonstrable in practice and acceptable to our prejudices. The established economic system, capitalism, is the sum of human experience—a compound of the ideas that have worked. It is not static; it is growing, progressing, working. We do not know what the end will be. All that we can do is to follow the ideas that develop out of the system and accept the result as best —the truth. Fatalism? Not at all! Sound sense! As a plain matter of fact, the capitalistic system of production is miles and miles ahead of us. If we had followed it instead of trying to lead it, hinder it, or kill it, we might now be rumpling up the sands of El Dorado's shore with full many an argosy's prow. Most of the evils charged to capitalism are really chargeable to our own stupid interferences, greed and prejudices. We heckle it, hamper it, cheat it and expect the common man to go on being loyal to it while he listens to the temptings of the destroyers. Loyalty rests on example more than on precept. Men cannot be got by mere words to adhere to a thing that is flouted by those they believe to be wiser than themselves—the very priests of the temple—and especially not when the destroyers devote most of their time in showing up the faithlessness of the men at the altar. We need a housecleaning. The men who believe capitalism to be a system of spoils and not of production need to be kicked out—contract-breakers, short-changers, makers of shoddy goods and all others who jeopard the service to which the best among us have dedicated their lives, their lands and their sacred honor.

Telegraphing Photographs by Code

The young Danish inventor, Thorvald Andersen, has devised an entirely new system of transmitting and reproducing photographs over long distances, which system, it is said, has great promise.

His arrangement of the details makes it possible to telegraph, telephone or radio a photograph as far as either of the electrical circuits his system employs may extend.

The London *Daily Express,* who invited the young Danish inventor to demonstrate his system in England, recently published three photographs cabled from Denmark across the North Sea to the London office of that paper. These three pictures were those of King George, Lloyd George and Irene Vanbrugh, the well-known English actress.

A unique feature of this demonstration of the Andersen system was the fact that the three photographs selected by the editor of the London *Daily Express* were picked out from a number of photographs after the inventor had started on the journey from Copenhagen to London, and were transmitted via the Andersen system by his brother in Denmark. When the inventor arrived in London, the three cablegrams in code from his brother awaited him, each of which constituted the make-up for one of the celebrities mentioned.

It is claimed that Mr. Andersen uses a special apparatus for translating the cablegrams and reconstructing the picture therefrom, which instrument and method has to be employed in a photographic dark room. The details of the Andersen system have not been given out yet, but he is frank to say that it is unlike any of the previous systems of transmitting photographs or photo-diagrams based on the employment of numbered or lettered squares.

THE telegraph and telephone employees in Vienna, Austria, who recently went on strike, reached a settlement with the government, which conceded to their demands for promotion by qualification rather than length of service, and small increases in pay.

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The Alexanderson High Frequency Alternator

By E. Blake.

To make the electromagnetic waves which are employed in wireless telegraphy it is necessary to set up in the transmitting aerial, alternating currents of extremely high frequency, these being generally known as high-frequency oscillating currents. Regarding 20,000 metres as (roughly) the longest wave used for commercial, or everyday, radio work, and 300 metres as the shortest, the fact emerges that for the production of the wave lengths and those of the intermediate orders we must employ oscillations of frequencies varying from 15,000 per second to 1,000,000 per second. No ordinary dynamo is capable of delivering current at a frequency anywhere approaching even the lower of these values.

Up to about 1914 most wireless communication was effected by means of damped waves produced by the discharge of a spark, but although the "spark" systems have done yeoman service and are, indeed, still largely employed, "continuous" or undamped waves are rapidly approaching the premier position, not only because their use permits of greater selectivity in receiving instruments, but because they are essential to wireless telephony and, moreover, are produced with much simpler and less bulky apparatus.

In spite of the fact that the "arc" systems, the Marconi "timed spark" system and the thermionic valve transmitter are all hard at work on the world's high-power stations, the idea of producing oscillating currents by means of a machine built along the lines of the ordinary powerhouse dynamo is very attractive, and the machine invented by Mr. E. F. W. Alexanderson, chief engineer of the Radio Corporation of America, is one of the several successful attempts to cope with the problem.

A magnetic field which is changing in strength—such a one which is being built up round a wire or which is collapsing upon it—will set up an electromotive force in a conductor suitably placed within it. The direction of the e.m.f. will be at right angles to the direction of the field. Changes in the strength of the magnetic field between the poles of an electromagnet may be caused by altering the strength of the current passing through the windings of the magnet *and* as the energy of these oscillatory currents is transferred to the line wires, from which it is picked up again at the receiving station by the detector. This detector, in series with its telephone receiver, is shunted across an oscillation circuit tuned to resonance with the oscillations set up by the transmitter. This resonance circuit is coupled to the lines through the coils in a very similar manner to an ordinary wireless receiving circuit, the coil representing the coupling coil used in the aerial circuit with the ordinary arrangements.

The function of the condensers remains to be explained. As far as the ordinary telephonic transmission along the lines is concerned these condensers are not required, and if their capacity is small they will not interfere with such transmission at all, but as regards the high-frequency currents from the coil they act as a bypath shunt to the windings of such shunt having a very much lower impedance to the radio-frequency currents than have these windings. As a result almost the whole of the high-frequency current will pass through the condensers, and an unappreciable amount through the transformer windings. The impedance of these windings will, therefore, not seriously damp out the strength of the oscillations, as they would were no condenser shunts provided.

The transmission of radio-frequency signals in this manner along telephone lines will not in any way interfere with the use of these lines for ordinary telephonic purposes, nor will their use for telephonic transmission hinder their employment for radio work, as we have just seen. As a matter of fact, in practical working the circuits are not usually so simple as would appear, as some kind of filtering circuits are required to prevent any of the low-frequency telephonic transmission from penetrating into the radio-frequency receiving circuits. Some such filtering circuits are also required when two-way and multiplex transmissions are concerned, in order to maintain the separate frequencies quite distinct from one another.

For two-way working two different frequencies must usually be employed—one for transmission, and another for signalling in the reverse direction. The radio-frequency apparatus will thus be duplicated, so that at each end of the line both a transmitter and a receiver are installed. The use of different frequencies for signalling in each direction, in conjunction with the tuned circuits at the receiver, enable the currents of different frequency to be sorted out, so that each receiver is affected only by its appropriate transmitter.

The advent of practical thermionic-valve apparatus enabled great strides to be made in the development of this type of communication, as by using the continuous waves from a valve generator radio-frequency telephonic as well as telegraphic transmission is possible, while, further, the greater sensitiveness of the modern-electrode valve-receiving apparatus enables much greater ranges to be accomplished with a smaller expenditure of power at the transmitter.—*The Wireless World.*

The latest approved model of the Western Electric Company's multiplex and "Start Stop" printing telegraph systems, including a repeater of the rotary type, with provision for extending arms both at the repeater and at a terminal station, is being exhibited in London, England, for the benefit of the European telegraph administrations.

There are twenty-one telegraph companies operating in this country with a total pole line of 241,012 miles and 1,888,793 miles of wire. More than 155,000,000 messages are transmitted a year. For the convenience of customers 28,865 offices are scattered over the country. A total of 39,600 employees receive salaries amounting to nearly $40,000,000 annually.

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Student's Course in Technical Telegraphy

By Louis Casper.

Lesson 21.

In the two preceding lessons covering various methods of making Varley loop tests, the bridge arms A and B were always figured on an invariable resistance basis. There are times, however, when it is desirable to base calculations with greater ex actitude than can be obtained by this method.

This would be notably true in cases of short lengths of line or cable conductors where it is essential to obtain a location in feet rather than in miles.

This is accomplished by means of a multiplied ratio used in the arms A and B in the Varley test. The arm values are usually made 10 in A and 1,000 in B, in which event a ratio of 1 to 100 would be obtained.

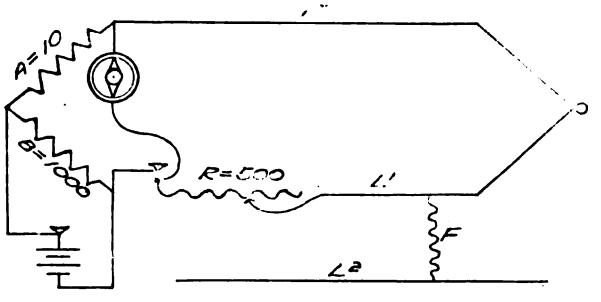

FIG. 46

In Fig. 46 we will suppose there are two crossed wires or conductors in a cable shown as L^1 and L^2, having an approximate length of 2,000 feet. As in a previous test one of the crossed lines is looped to a good line L^2 and a loop measurement is made as shown. We will suppose that the result is 500 ohms.

The formula in this case would be:

$$R = \frac{A \times L}{B} \text{ where}$$

L = Loop resistance
A = 10 ohms in Bridge Arm A
B = 1000 ohms in Bridge Arm B

It is obvious that the answer is 5 ohms.

The Varley connection is then made as shown in Fig. 47.

Assuming that it takes 300 ohms to effect a balance with this connection, then the formula which governs is

$$L - \frac{(L+V) \times A}{B+A} = F$$

(in which V = Varley measurement)

Reducing this formula to figures as per example stated:

$$\frac{5 - (5 + 300) \times 10}{1{,}000 + 10} = 1.98 \text{ ohms}$$

If in this case the lines are No. 9 B. & S. gauge copper wire, the approximate measurement per foot would be .0081 ohm at 68° Fahrenheit, and the distance to the fault will be $1.98 \div .008 = 248$ feet nearly.

In Figs. 46 and 47 a third and good wire or cable conductor L^3 is used, looping the same with one of the crossed wires, L^1. As indicated in previous Varley tests, this third wire if not available can be dispensed with, and the Varley measurement made with the two crossed wires or cable conductors L^1 and L^2, in which event the second crossed conductor could be grounded at some point beyond the fault. (See Fig. 45 in the preceding lesson.)

Murray Loop Test

So far in these lessons the solution of the location of crosses and grounds on wires has been exemplified by means of the Varley loop formula, which method, as previously explained, is considered the most reliable. There are, however, other tests which under certain circumstances have been found to be quite satisfactory in the results obtained.

One of these methods is known as the Murray loop test, which recommends itself to many by reason of its simplicity. It is possible to make this test with simply a galvanometer and a rheostat, the latter of course to be accurate in resistance values.

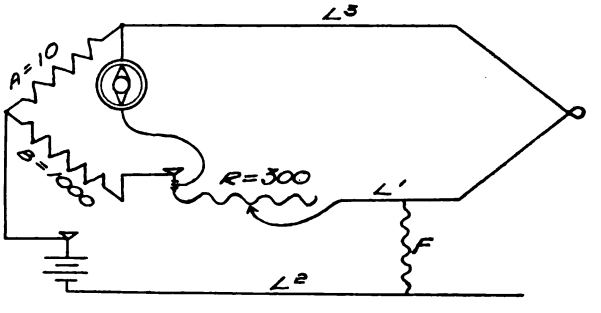

FIG. 47

The difference between the Murray and Varley tests is that, in the former case, only one of the regular arms of the bridge is utilized, the other arm being represented by the balancing rheostat, which should have a considerable range of adjustment.

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When there are two looped wires of the same kind and gauge, and on one of these wires, it is desired to locate a fault, the initial loop measurement may be dispensed with, and a test to the fault may be made and figured out directly, either in resistance or the distance in feet or miles.

The success of such a test, however, would depend upon it being fairly well known that there is no chance inequality in the normal resistance of the two wires to be measured or an imperfect connection or contact at the distant station or elsewhere.

By referring to Fig. 48 the resistance in the bridge arm A remains fixed (in this case 100 ohms) while the opposite arm is now the rheostat R, which is substituted for bridge arm B of the Varley tests. F is the fault to be located, Y the distance from X to F, and C the distance from A to F.

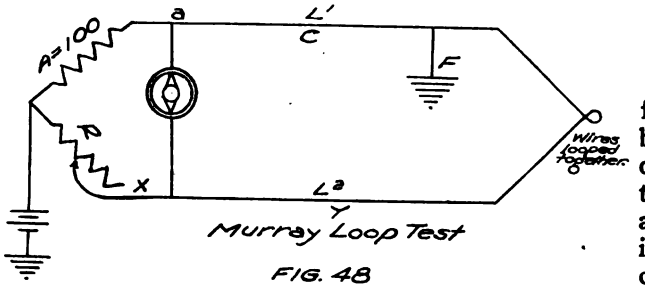

FIG. 48

The rheostat R is adjusted until there is no deflection of the galvanometer. From the discussion disclosed in previous lessons, this will be seen to occur when the resistance R bears the same proportion to Y as A does to C, or in terms of proportion, as R is to Y, A is to C.

For example, the known distance of the lines L^1 and L^2 looped together is 100 miles and the resistance is 500 ohms. A fault occurs at a distance from C to F.

The resistance of the arm A is fixed at 100 ohms. The rheostat R is adjusted until the galvanometer stands at zero with the resistance value = 400 ohms. R is, therefore, 4 times that of the bridge arm A. Y must bear the same proportion to R that A does to C; therefore, Y must be four times C, as Y and Z representing lines L^1 and L^2 added together equal the entire resistance of the loop. Y will be four-fifths and C one-fifth of this resistance. Y, therefore, equals 400 ohms and C equals 100 ohms. Or, if length alone is to be calculated, R to Y equals four-fifths of the distance, or 80 miles, and X to C equals one-fifth, or 20 miles distant to the fault F. The formula governing the calculation for Murray tests is obtained by ascertaining the length from a toC by the equation

$$\frac{A}{A+R} \times L \text{ in which}$$

A = Bridge arm
R = Rheostat resistance
L = Length of loop

Reduced to figures as per example stated:

$$\frac{100}{100+150} \times 500 = 100 \text{ ohms}$$

which is the distance from a to C, and which terminates at the fault F.

(To be continued)

Be an Authority on the Telegraph

"Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, offers the most complete study of the telegraph ever published. This standard text-book has been revised and brought up to date, and in addition to numerous diagrams and complete information covering the study of the telegraph, includes full descriptions of the newest apparatus adopted by the Western Union and Postal Telegraph companies, and the equipment of a modern telegraph office. This valuable book, with its 488 pages, 250 illustrations, and carrying an appendix of 24 pages and 16 illustrations covering the new Western Union Multiplex System, is the most sought after electrical book on the market. $2.50 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Radio Buzzer Sets

TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, can supply buzzer sets for learning the continental alphabet by means of buzzer signals, the same as heard in telephone receivers used in regular radio working. These sets are equipped with key, high-tone buzzer, and flash lamp signal, complete on one base. The price is $4.00 for the set.

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EDITORIAL COMMENT

The Enjoyment of Knowledge

President Lowell of Harvard University in his annual report said:

"The best and most fruitful conception of a university or college is the ancient one of a society or guild of scholars associated together for preserving, imparting, increasing and enjoying knowledge."

This is perhaps the first time we have ever heard of the term "enjoying knowledge" being used in any kind of an educational report. It is an absolute truism, however, and those who do not make knowledge one of enjoyment are confronted with difficulties which appear to them insurmountable.

The head of a large trust company will tell how employers are looking for men who have been trained to grasp intricate situations and digest them quickly. The president of some great industrial corporation will describe the opportunities offered to men who have been taught to think and think straight. All such suggestions treat education as a preparation for careers in commerce and industry and professional life, as something which is good because of something else that it will enable the educated to obtain.

Thousands of failures of individuals are due wholly to the fact that they did not enjoy knowledge. They made it a labor to acquire, with the result that instead of being able to devote all of their time to their employing interests it was necessary for them to acquire the knowledge that they should have possessed.

If the result of education is, as an authority defined it, to be able to think, to think straight and to think continuously, they enjoy practicing this acquired ability. Thinking, instead of being a labor. is a joy to them, and they take enjoyment out of thinking.

President Lowell does well to emphasize this fact in this age of incessant and dominant practicality.

CAREFUL investigation of accidents has revealed that many occur because of the fact that employees are worried over financial matters. Through sickness they find themselves in debt, and while at work they brood over their troubles, and in an unguarded moment fail to take proper precaution and an accident occurs. Any employee who has formed the habit of saving part of his income, will avoid the sort of worry that often leads to accidents.

WHEN the telegraph service is slow, which happens during great storms, there is naturally a disposition to complain on the part of the public. When the telegraph service is unusually prompt it seldom or never occurs to the public to sound the praise of the telegraph companies.

Bandits Rob Telegraph Offices

Apparently, telegraph offices are not immune from raids of the present-day bandit, for we receive with far too great frequency, notices of these hold-ups from different parts of the country.

THE Edison Medal, awarded annually to a scientist who has done notable work in electrical engineering, will go this year to Dr. M. I. Pupin, professor of electro-mechanics at Columbia University.

Mr. Edison's Seventy-fourth Birthday

The Edison Pioneers, an organization of old-time associates of Thomas A. Edison, held its annual meeting on February 11th, the inventor's seventy-fourth birthday. The meeting took place at the Edison home, Glenmont, Llewellyn Park, West Orange, N. J., in response to an invitation extended by Mrs. Edison at last year's meeting, which was held in the restaurant of the Edison Storage Battery Company.

Dinner was preceded by a business meeting. The women and children of the members were entertained by Mrs. Edison. Frederick A. Scheffler was chairman of the arrangements committee and T. Commerford Martin headed the reception committee. William J. Hammer is president of the Pioneers.

The organization originally consisted of men who were associated with Mr. Edison between 1870 and 1885, but a junior group has been formed, to which are admitted those who were with him between 1885 and 1900.

Orders Western Union Poles From Right of Way

Federal Judge Evans, at Louisville, Ky., on January 22nd, ordered the Western Union Telegraph Company to remove by November 1st next its poles and wires from the right of way of the Louisville and Nashville Railroad Company.

The order is a sequel to long litigation between the companies over the question of the Western Union's right to maintain its equipment on railroad property.

Counsel for the Western Union said that an appeal to the United States Supreme Court would be taken on a phase of the case involving constitutionality of a Kentucky law denying telegraph companies the right to condemn a right of way on railroad property.

THE English Government has increased the telephone rates in that country and a storm of indignation is the result. High rates and poor telephone service now go hand in hand in the English metropolis.

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Semi-Automatic Sending Keys

Committee No. 6, of the Telegraph and Telephone Section of the American Railway Association on Message Traffic, has issued a bulletin in regard to Semi-Automatic Sending Devices now largely used on the various railroad systems. The committee states that the section should adopt as recommended, practice for the mechanical and electrical adjustment of semi-automatic keys, the instructions embodied in traffic circular No. 44, issued by the Western Union Telegraph Company, which reads as follows:

"The results obtained by a series of sending-machine tests warrant the following conclusions:

1. Utility of Sending-Machines. A sending-machine in good condition, properly adjusted and competently handled, will carry reliably on all workable circuits without the changing of any adjustments save that which regulates the speed.

2. A General Principle. Changing the rate of vibration varies the lengths of both dot and space proportionately, while changing the relation of the dot-contact points increases one at the expense of the other. (In this statement the word "space" refers to the spaces mechanically made by the machine in a stream of dots.)

3. Light Signals. If a receiving operator states that the signals are light, and the circuit cannot be improved, the remedy is to lengthen the dots by reducing the speed of vibration, not to change the relation of the dot-contact points.

4. Heavy Signals. If a receiving operator states that the signals are too heavy, and the circuit cannot be improved, the remedy is identically the same as in (3), namely, reducing the speed of vibration as that will increase the length of the spaces.

Examination and Adjustment

The adjustments of semi-automatic keys are both mechanical and electrical, and the examinations should be made in that order.

Mechanical Examination and Adjustment

1. Preliminary Inspection. See that both the dot and the dash contact posts are rigid, that the cord is sound, and so attached to the binding posts that a pull on the cord is not a direct pull on the exposed parts of the wire.

2. Springs and Lever Action. See that the springs are neither too weak to act nor too strong for comfort, and that the lever is not held too tightly by the trunion screw. The lever should move easily, yet without wobbling.

3. Contact Points. File both the dot and the dash contacts smooth, and make the contact surfaces parallel when they meet.

4. Adjustment of Dot-Contacts. Turn the stop-screw on the same side of the machine as the deadener till the reed rests against the deadener without pressure. Clamp the stop-screw. With the reed in this position, the distance between the dot-contacts should be one-sixteenth of an inch. If it is not, turn the dot-contact screw until it is, then clamp the screw.

Now by means of the other stop-screw, *i. e.*, the one on the same side of the machine as the stationary dot-contact post, move the reed until the two dot-contacts meet squarely but without pressure Clamp the stop-screw. After the clamping, see that the two dot-contacts meet without pressure when the reed is moved slowly by the handle.

This adjustment may be slightly modified by the succeeding operations, but this modification has been taken into account in the instructions just given.

Electrical Examination and Adjustment

1. Resistance of Machine and Cord. Measure the resistance of machine and cord, first, through the switch; second, through the dash-contacts; third, through the dot-contacts when the two points are pressed together by the hand. The total resistance in all cases should be less than one ohm.

2. Mil-Ammeter Adjustment. Place the machine in series with the mil-ammeter and one 150-ohm relay on a local circuit with a current of between 40 and 60 milli-amperes. A way circuit will not do. Be sure that the machine rests on a horizontal base.

Make groups of six dots each at a moderate rate of vibration, allowing time between the groups to permit the needle to return to zero. By "moderate" rate of vibration is meant a speed corresponding to that of a hand-sender, sending about thirty-five messages an hour. Neither a high rate of vibration nor a low rate will give the best results.

The highest mil-ammeter reading for each group of six dots should be two milli-amperes less than one-half the reading on closed key. If this is not the case with the instrument being tested, turn the dot-contact screw until this reading is obtained, then clamp the screw. Repeat the dotting process to make certain that after the clamping the position of the dot-contact point was not changed.

Summary. When the reed rests against the deadener, the distance between the dot-contact points should be one-sixteenth of an inch, and when a group of six dots is made, the highest mil-ammeter reading should be two milli-amperes less than one-half the reading on closed key.

Note: The distance between the dash-contacts does not affect the carrying power of the machine. It may be just sufficient to enable one to see clearly between them. One sixty-fourth of an inch is ample.

Approximate Adjustment. An approximately accurate adjustment may be obtained by the mechanical examination and adjustments without the electrical measurements.

The committee feels also that the following comments and conclusions based on observations and tests will be beneficial to those charged with supervision and the education of operators in the use of semi-automatic keys.

The electrical impulse which closes the reading circuit is called "Marking" and the impulse which opens it is called "Spacing." Perfect signals, as from a Wheatstone transmitter, registered on tape when dots are transmitted, will show fifty per cent. "marking" and fifty per cent. "spacing," *i. e.*, the length of the dot characters (marking) and the dis-

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tance between the dot characters (spacing) on the tape, will be equal.

Hand-sending is biased toward spacing and what is known as perfect Morse will be found to register sixty to seventy per cent. spacing; hand-sending that approximates the fifty-fifty division of marking and spacing sounds sluggish or "muddy" on unrepeatered wires but carries well on long-distance repeatered circuits. Hand-sending that is more than ordinarily biased toward spacing sounds "light" on unrepeatered wires and fails to carry through repeaters, dropping out, especially on final dots.

Operators changing from hand to semi-automatic key-sending, maintain the same proportion between marking and spacing and the quicker action of the semi-automatic key accentuates the bias. The light sending fault, usually ascribed to improper adjustment of the key, or poor judgment on the part of the sender, is not properly chargeable to either unless the operator has been told where the fault lies and given assistance in correcting it.

Managers, wire chiefs and division operators should be educated to watch for this fault and to assist the operators in correctly gauging the proportions of marking and spacing in their sending whether hand or machine. Periodical examination and adjustment of semi-automatic keys should be made; the manager of the office keeping a book record showing the date the keys are examined and their condition, which record should be examined regularly by the telegraph department supervisory forces.

The committee believes that a close co-operation between managers, wire chiefs and division operators in insisting upon the proper mechanical and electrical adjustment of all semi-automatic keys and training operators in their careful use, will bring about a high standard of proficiency.

The committee recommends, also, that the manufacturers of semi-automatic keys be required to use stranded wire cord instead of the tinsel cord now being used for the reason that tinsel cords after wear frequently contain a variable resistance before the circuit is broken entirely. This variable resistance causes faulty signals sometimes charged to line or apparatus trouble. It is also suggested that the manufacturers' attention be directed to the importance of a uniform tension in all reed springs as it has been found that the reeds vary to an extent that operators in some cases use two and three governing weights to regulate the tension.

It is recommended, also, that the wedge plugs on cords be made of uniform thickness to fit between the lip and base of keys withous damage to the lip.

Life Insurance Association for Telegraphers

The Gold and Stock Life Insurance Association, of 195 Broadway, New York City, which pays a monthly income of $50.00 for ten months to the beneficiaries of its deceased members, is now entering upon its forty-fourth year. According to the report of its operations for the year 1920, soon to be distributed to the members, the association has had a most successful twelve months, both financially and from the standpoint of membership gains.

The secretary of the association tells us that in the latter part of 1920 a number of applications for membership began to reach him, and that the new business has continued coming in with even greater impetus since January 1st this year, due no doubt to the efforts of the officers and local representatives who are bringing to the attention of employees of both telegraph companies the many advantages of membership.

The association elected for the ensuing year: President, Gardner Irving; vice-president, Charles Shirley; secretary, H. W. Dealy; treasurer, Joseph W. Connolly.

The secretary's report shows seventy-eight new members admitted during 1920, while the treasurer reported an increase in reserve of nearly $3,000.00, making the total now in the treasury $12,701.54.

The condensed financial statement follows:

On hand December 31, 1919	$10,104.98
Receipts 1920	10,829.36
	$20,934.34
Total expenditures (including death claims paid)	8,232.80
Balance in treasury December 31, 1920	$12,701.54

Books Covering Printing Telegraph Systems

To meet the growing demand of those desiring books covering printing telegraph systems we strongly recommend the following works, which give a wide range of study on all of the printing systems in use to date:

Crotch, Arthur.—Hughes and Baudot Telegraphs; 83 pages; 41 illustrations. This is a practical description of these two systems of telegraphy which are in extensive use in England and on the Continent; devoid of mathematics and technicalities; a timely book for American student telegraphers; $1.25.

Finn, Wm.—The Barclay Printing Telegraph System; paper cover. This work describes in detail the Barclay Printing Telegraph System; 50 cents.

Pendry, H. W.—Baudot Printing Telegraph System; 144 pages; 60 illustrations. This is a very complete description of this important system of telegraphy and is written in a clear manner; well adapted for self-instruction; devoid of mathematics; treated practically and not technically; $1.40.

The Morkrum Printing Telegraph System was illustrated and described in all its details in TELEGRAPH AND TELEPHONE AGE, dated November 16, December 1 and 16, 1919, January 1, January 16, February 1, and February 16, 1920. Price of these seve nissues, $1.50. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, John B. Taltavall, Publisher, 253 Broadway, New York.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.

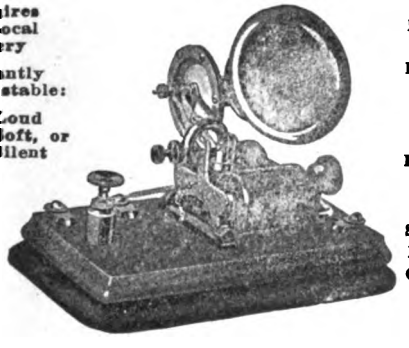
1205 Hobart Bldg., San Francisco, Cal.

2044 Railway Exchange Bldg., St. Louis, Missouri.

DIAPHRAGM *Telegraph Sounder*

Requires No Local Battery

Instantly Adjustable: Loud Soft, or Silent



Black Enamel Horn

Trouble Proof

Saves Battery Cost

How Other Telegraph Engineers are Solving the Local Battery Problem

Telegraph Engineers for more than 100 Railroads, Pipe Lines and Oil Companies, are using Diaphragm Sounders successfully to replace local battery and sounder in circuit.

Offices provided with Diaphragm Sounders enjoy uninterrupted service regardless of local conditions.

If not prepared to supply all offices with Diaphragm Sounders—furnish an office at a time until a complete circuit is thus equipped.

Performance counts—put it to the test. Equip all your relays with Diaphragm Sounders.

Descriptive Folder on Request

RAILWAYS LABOR SAVING DEVICE CO.
1106 Arlington Ave., DAVENPORT, IOWA

A Money Saver to Railroads

HALL SWITCH & SIGNAL CO.

Garwood, N. J. Chicago

MANUFACTURERS OF THE

GILL SELECTOR

THE UNIVERSAL SELECTOR
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THE RAILROAD
TELEGRAPH AND TELEPHONE

H. HULATT has been appointed manager of telegraphs, western lines of the Grand Trunk Railway System with headquarters at Montreal, Que., the position of consulting manager of telegraphs having been abolished on February 1st.

THE Radio and Wired Wireless Committee of the American Railway Association has distributed among its members a sixteen-page pamphlet descriptive of the Rogers System of Underground and Sub-Sea Wireless Communication.

Telegraph and Telephone Section of the American Railway Association

The membership of the Telegraph and Telephone Section of the American Railway Association has received from Secretary W. A. Fairbanks a ninety-two page booklet reviewing the action taken by the Winnipeg meeting September 22, 23 and 24, 1920, on the question of specifications for the installation of telegraph and telephone equipment in railroad offices. Several changes have been made in the specifications, and these changes have been called to the attention of the membership, and will undoubtedly be agreed to.

The subject of Protection Against Electrolysis was accepted at the Winnipeg meeting to be submitted to letter ballot, as revised, for inclusion in the Manual. The recommendations made are shown in a thirty-six page report, which is being submitted to all members for action. The ballot will be closed on February 15th, and it is hoped by the Committee of Direction that every member will have voted on the subjects.

Radio for Railroad Work

J. D. Jones, chairman of Committee No. 12 of the Telegraph and Telephone Section of the American Railway Association, has forwarded a circular letter to the membership at large. It reads in part as follows:

In connection with the discussion which took place at a session of Committee No. 12, relative to the advisability of having the present radio laws concerning the operation of radio and wireless stations modified to permit radio and wireless stations operated by industrial concerns and railroads to send messages in the Morse Code, as well as eliminate telegraphic code requirements from radio telephone operators' examinations and licenses.

A re-draft of that part of the radio communication laws of the United States and International Radio Telegraphic Convention, edition of August 15, 1919, covers the issuance of radio telephone station and operators' licenses for radio telephone communication in railroad operations, under "Transmission of Radiograms—Signals of Transmission."

The paragraph covering issuance of radio telephone station and operators' licenses is new and would be inserted directly after that part of Section 4, under regulations reading: "The Secretary of Commerce may, in his discretion, waive the provisions of any or all of these regulations when no interference of the character above mentioned can ensue."

The modification of Article XX would read: "The signals to be employed are those of the Morse International Code, except by such radio stations operated by industrial concerns and railroads, where the signals employed for transmission and reception of telegraphic communications may be those of the American Morse Code."

THE position of assistant superintendent of telegraph and signals of the Pennsylvania System at St. Louis, Mo., has been abolished. E. M. Pence has been transferred to Cincinnati, to occupy his former position as division operator at that place.

During the past two years the Canadian National Railways have made considerable advance in the use of train telephone dispatching equipment, and during this short space of time have equipped approximately two thousand miles of main line with the most modern apparatus. The "People's Railway" has the advantage in that it has adopted the very latest equipment and practices which experience has demonstrated to be the best.

The dispatching equipment was installed and is used solely for the handling of train movements, but a recent test made between Hornepayne and Montreal, via Toronto, gave excellent results, and the transmission over this distance (approximately 1,000 miles) was very good, considering that no expensive repeating apparatus was used. Demonstrations have also been made between Montreal and Toronto, and it was stated by engineers of several telegraph and telephone companies that this circuit was exceptionally quiet and the transmission exceedingly good, notwithstanding the fact that considerable cable forms part of the circuit, and that it also parallels a number of high tension power lines.

Officials and employees alike have nothing but praise for this method of handling trains. It is now possible for trains to keep in touch with the despatcher at all times by the use of special portable telephones, and this is especially beneficial in increasing the efficiency of the system.

Make a thing better than it has ever been made before and you better yourself and your fellow creatures by what you have created.

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Industrial

Diaphragm Telegraph Sounders Are Efficient

H. S. Spiers, agent of the Norfolk Southern Railroad and manager of the Western Union Telegraph Company at Fentress, Va., says that he has had Diaphragm Telegraph Sounders in use in his office for the past six years without an interruption or failure of any kind and the sounders are just as good now as when they were first purchased, and from all appearances they will last as long as the relays. This is the verdict of every user of Diaphragm Telegraph Sounders. Those who would like to look into the merits of this device, with the idea of adopting them, if found efficient and satisfactory, ought to write for a booklet to the Railways Labor Savings Device Company, 1108 Arlington Avenue, Davenport, Iowa.

THE Jester-Cooper Company, Houston, Texas manufacturers of the J-C Repeater, has received from the electrical engineer of one of the Central American republics the following: "The set of J-C repeaters received. I am very glad to inform you that I tried this set on our worst circuit and got the best of service. In fact, better than with any other repeater. Please send us another set at once." Wherever the J-C Repeaters are used satisfaction results.

OBITUARY.

Daniel E. Colestock, aged seventy-eight years, an old-time and United States military telegrapher, died at Titusville, Pa., on January 18th. When the Civil War broke out Mr. Colestock became a telegrapher in the army operating in West Virginia. At the close of hostilities Mr. Colestock entered the Western Union Telegraph Company's service at Pittsburgh, Pa. He soon became chief clerk to Superintendent Charles O. Rowe. When the latter's district was removed to Titusville Mr. Colestock went with him. In 1883 when the district headquarters were transferred back to Pittsburgh Mr. Colestock engaged in commercial business at Titusville with which he had been identified until twelve years ago, when he retired. Mr. Colestock was held in high esteem in the community in which he had lived for so many years.

Arthur W. Naylor, aged sixty-six years, died at Pittsburgh, Pa., on January 9th. Mr. Naylor began his career as a railroad telegrapher. In 1880, however, he transferred his services to commercial lines and was identified with the American Union Telegraph Company and press associations at Pittsburgh, from the time until his death.

MRS. SOPHIA R. HENNESSEY, aged seventy-six, an old-time telegrapher of Niagara Falls, N. Y., died on February 4th. Mrs. Hennessey was manager of the New York Central telegraph office in that city for over forty years.

RADIO TELEGRAPHY

Installation of Wireless Stations in Venezuela

A definite program has been established by the Venezuelan government for the installation of twenty-two secondary wireless stations. Contracts have already been awarded to an American citizen for installing wireless towers at the following points: Maracay (installation completed), San Cristobal, Maracaibo, Puerto Cabello, Coro, La Guaira, and Ciudad Bolivar. The station at Maracay has been equipped with a 5-kilowatt set purchased from an American concern, and orders have been placed with American concerns for three other 5 and one 3½ kilowatt set. The type of instrument to be used at Coro and La Guaira will probably not be determined until about July 1.

Consideration of the proposal to install a central wireless station to communicate with the exterior has been deferred pending an expected material reduction in the price of steel and other commodities.

A Radio Operator a Victim of Amnesia

"Tick, tick, tick"—just the faintly audible sounds of a dummy telegraph apparatus as it responded to the touch of a physician in the Maryland General Hospital, at Baltimore, has served to bring to "Ralph, the mystery man," who has been a patient in the institution for more than three weeks, suffering from amnesia, the first glimmer of memory from his past life.

As "Ralph" heard the first click of the instrument he exclaimed: "I know now, I used to be a radio operator, and I worked on a big ship. But everything is hazy. I cannot remember where or when it was."

Faces of physicians and nurses were tense as they watched the big fellow wrestle with his memory, and then saw the light in his face fade as he lapsed into the vacancy that has held him almost like a child for nearly a month. But they hope that this glimmer of memory, even though it was only for a fleeting moment, may be the beginning of restoration.

Ship's S O S Laid to a Radio Joker

The alleged wireless appeal on January 26th of the freighter *Cannonier* for immediate assistance may have been the work of a wireless practical joker, who, if found out, will get into serious trouble with Uncle Sam and lose his license, besides. The *Cannonier* arrived in New York on January 27th and knew nothing about the S. O. S. report.

THE twenty-two high schools of New York are to be equipped with radio telephone and telegraph instruments. The telephone range is specified at 100 miles and the telegraph at 200 miles. A. G. Bauersfeld, supervisor of technical work in the schools, believes that all inter-high school business can be transacted by radio telephone.

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A WIRELESS telephone, to be used in the transaction of business, has been installed by the Pittsburgh Chamber of Commerce. In a statement made public February 5th the Chamber informed its members that a radio telephone, connecting with 300,000 operators within an area of about 3,000,000 square miles surrounding Pittsburgh had been set up at the organization's offices. Members are invited to make use of the instrument in the transaction of business.

Message by President-Elect Harding for Radio Competition

A thirty-word wireless message to be written by President-elect Harding and to be broadcasted from Hartford, San Francisco and Rockford, Ill., on February 21st, will be the subject of a competition in wireless operation among long-distance amateurs in all parts of the United States.

THERE are today in this country more than 200,000 homes where amateur wireless operators are receiving telegraph and telephone messages through the air. Within a short time it is predicted that business houses and shipping circles will be using radio telegraph in every-day routine.

AN inventor of Croydon, England, has developed a system of receiving wireless signals at a speed of one hundred words per minute, on a perforating machine. Then the matter is fed into an automatic typewriter at a lower speed. A demonstration of the device was recently made before the London Royal Society of Arts.

A RADIO service was inaugurated between London and Paris by the British Marconi Company on January 8th.

Police Alarms Now Sent Out by Radio

The New York Police Department is experimenting in sending alarms to the police departments of neighboring cities by wireless.

Since February 1st alarms for stolen automobiles have been wirelessed from police headquarters.

Radio Corporation of America

PRESIDENT E. J. NALLY is now in London. He is accompanied by Mrs. Nally.

HONORABLE JOHN W. GRIGGS, general counsel, is spending a few weeks in Bermuda.

OPERATOR HAROLD PHELAN, of the steamer *Porto Rico*, died suddenly in a hospital at San Juan, after an operation for appendicitis. He was a native of Wakefield, Mass.

THE comptroller's and treasurer's departments are now located in the north wing of the eighteenth floor, Woolworth Building, occupying new space recently leased to make additional room for the engineering and commercial departments.

THE CABLE

Annual Report of the Pacific Cable Board

The Pacific Cable Board's annual report for the year ended March 31, 1920, shows net traffic receipts of £642,948, an increase of £88,436 over the previous year. Of this amount £353,000 was appropriated to reserve and renewal accounts, and after providing for all other charges, there was a surplus of £10,433, which has been applied to reduce the outstanding balance of the original government advance of £2,000,000. The international traffic handled during the year covered 9,000,000 words, and in addition there were handled about 2,320,000 words between Australia and New Zealand, and between those dominions and the Pacific islands. The week-end deferred cable service will be resumed as soon as possible. Government traffic exchanged between the United Kingdom and Australia and New Zealand was about 2,200,000 words, about 1,300,000 less than in the preceding year.

C. H. TRANFIELD, superintendent of the cable station of the Western Union Telegraph System at Heart's Content, N. F., together with his wife, recently gave a masquerade ball to the cable staff and friends at that place. About sixty couples were present, dressed in varied costumes and the scene as one entered the beautifully decorated hall was entrancing. The wonderful variety of costumes, the bright colors, and, as one mingled with the dancers, the utmost good feeling, made the occasion one which will be long remembered. F. T. Peach acted as floor manager.

WILLIAM C. JAMES, supervisor in the London office of the Commercial Cable Company since 1884, was retired on pension on January 1st of this year.

THE headquarters of C. H. MacBeth, northern divisional manager of the Western Union Cable System in England, has been transferred from London to Liverpool.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

The more you "kite" the closer you get to the lightning.

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Good Bye, My Pal

James E. Maddock, of Chicago, identified with the bond house of H. M. Byllesby and Company, writes us as follows:

On the last page of the house organ of the Aetna Life Insurance Company, Cleveland office, there appears the most touching tribute it has ever been my pleasure to read, and I send it to you for your personal information and for use if you wish to do so. It approaches the sublime and compares favorably with efforts of noted writers.

Peter R. Fahey was born in Baltimore, where he worked as messenger boy for the Western Union Telegraph Company, later learning telegraphy. In the late eighties he went west, stopping for a time in Cleveland, where he formed an acquaintance with the girl who afterward became his wife. He remained in Cleveland only a relatively short time, going on to Chicago, where he worked for the Western Union Telegraph Company a year or two, but never forgot the attractions of Cleveland, and later returned there, married the girl he had met previously, and made that city his home.

It is likely old timers in Baltimore and Chicago as well as in Cleveland will remember him. A man who can pen such a verse is well worth remembering.

FAHEY'S FAMOUS FABLES
(*A Slight Digression*)

Sadie I. Fahey, wife of the editor of Wilson's Aetnagram, passed away to her eternal reward on the evening of January 2nd, after a long illness which was originally precipitated by the departure of our oldest son to war, where he served as an officer overseas.

The "copy" for this edition was just about ready for the printer when this bereavement overtook us. Naturally it would not be consistent to have us appear as producing pleasantries at this particular period.

We shall, therefore, withhold our customary "fables" from this column in the present issue, and in their stead, offer the little contribution shown below, which is self-explanatory.

In justification, it might not be amiss to explain that the deceased was known personally to probably more than one-half of all our Cleveland office associates, and two of her ten children had previously served the Aetna in this Ohio Agency, one of them having been a sudden victim of the "flu" less than two years ago. Incidentally, it is the third visitation of death in our family circle within two years, each of the departed having been strong physical specimens before being suddenly striken down.

These facts will make it easier to appreciate the sentiment animating our soul when we penned the attached memoriam, to which we have given the simple heading of

"GOOD-BYE, MY PAL"

Today I lay aside the pen,
That long has written cheer,
And crave indulgence for a time,
To shed a bitter tear,
For death has entered in my home,
So, bear with me, I pray,
While I jot down a parting word,
Of her who's passed away.

For more than thirty anxious years,
We fought the good old fight,
Her kindly voice still echoes clear
In bed-time prayers at night.
With children (ten) demanding care,
No soldier on the field
Could do a lot of greater good
That "Mother's" life did yield.

We've seen her cool the fevered lips,
And smooth the aching brow,
We've watched her ministrations kind,
That brought relief, somehow.
She taught each child, from time to time,
The first words they could say,
A garland should be on her tomb,
Since now she's passed away.

Her trials were many, patience great,
With temper always mild,
She spent her strength, and gave her best,
To each and every child.
If "Mother's love" deserves response,
Then it is fair to say,
Her brood will always be in debt,
To her who's passed away.

Oh, God, please make us understand
Why such a cruel fate
Should be imposed upon a soul,
As gentle as this mate,
For surely such a heart as hers
Should not have had to spend
So many years of darkest night
Before the final end.

But now that she has passed and gone,
We borrow of this pen,
To say a word of last farewell,
And close it with "Amen."
For, like all others of the flesh,
Her race at last is run,
And we kneel down, and humbly say,
"Thy will, Oh, Lord, be done."

This simple laurel on thy grave
I place with tear-dimmed eye.
'Tis just a word of olden days,
To say a last good-bye.
"Green be the mound above thee,
Chum of my better days,
None knew thee but to love thee,
None named thee but in praise."

Nothing is worth while if you quit it before you have completed it; contend to the end and let your interest and enthusiasm overcome your difficulties and the thought of the hard work.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

AUTOMOBILE license number "73" has been issued to Colonel Robert C. Clowry, formerly president of the Western Union Telegraph Company, now living in retirement at Tarrytown, N. Y.

HORACE G. MARTIN, the inventor and manufacturer of the well-known Vibroplex, who has been in Florida for some time, is again in New York busily engaged in turning out his popular transmitting telegraph instruments.

POSTAL TELEGRAPH-CABLE COMPANY

THE statement of Clarence H. Mackay, president of the company, on International Cable Communication delivered before the Senate Committee on Interstate Commerce, Washington, D. C., on January 10, and which has been referred to in previous issues, has been printed in book form for general circulation. It makes a neat twenty-four page booklet, and it is considered a remarkable exposition of the German cable situation.

J. J. WHALEN, traffic manager, is on a trip of inspection through the middle west in connection with traffic matters.

E. P. TULLY, assistant to the general manager, is also on an inspection trip covering the larger points in the western division in connection with continued improvement of service.

W. C. DAVIET, assistant to the general manager, spent a few days in Ohio in connection with telephone development.

R. GOULD, of the plant department, is on a trip through the South in connection with construction matters.

RECENT executive office visitors were C. E. Bagley, superintendent, Philadelphia, Pa., and E. Kimmey, superintendent, Boston, Mass.

WARD A. DANNA, all-night repeater chief at the Meadville office, died suddenly on February 4th Mr. Danna had been with the company since 1888.

I. A. MICHAELS, manager, Mishawaka, Ind., died suddenly on February 3rd.

THE Florida east coast extension of the Postal Company's lines has been completed and offices are now open at Daytona, West Palm Beach, Fort Lauderdale and Miami. This extension of three hundred miles opens up a new territory, giving these points the benefit of competitive service. The offices at these places have been fitted up in first class shape and with modern equipment, under the direction of General Superintendent G. W. Ribble and Superintendent J. C. Dolive. New offices have also been opened at Okmulgee and Shawnee, Okla.

MANAGERS APPOINTED: A. M. Hook, Middletown, Ohio; P. J. Danihy, Kokomo, Ind.; J. H. Ward, Ocala, Fla.; H. H. Waters, Madison, Ga.; W. J. Commer, Port Arthur, Texas; J. G. Charbonneau, Kenosha, Wis.; H. E. Daniels, Lamar, Colo.; E. T. Burke, Norristown, Pa.; Mrs. H. Pope, Prescott, Ark.; P. J. Reilly, Johnstown, Pa.; Miss Clara Thompson, Fort Valley, Ga.; Miss Ellen O'Berry, Dade City, Fla.; J. T. Meough, Lexington, Neb.; J. W. Jones, Anderson, S. C.; W. J. Jennings, Pottsville, Pa.; E. Thornsberry, Peabody, Kans.; C. G. Hall, Elyria, Ohio; W. A. Davis, Coleman, Fla., and C. M. King, Henderson, N. C.

Boston

HERBERT D. CASSITT has returned to work after an absence of one month caused by an accident in which he broke his ankle. At present he is resting up on his annual vacation.

MISS EDITH ROTCH, one of our regular operators, recently won first prize in the Radcliffe Ice Skating Tournament. Miss Rotch is a graduate of Radcliffe.

P. J. SULLIVAN is relieving Manager White at the *Herald* while the latter is away.

MR. BURKE, of the quad department, seems to be able to maintain his supremacy as a checker player. There is no one found so far who can beat him.

WE HAVE recently had installed a new Foote Pierson Morsegraph, which is now covering twenty-four of our circuits.

OPERATOR BRENNAN has left us to accept a position with a broker, while Mr. Golder has gone to the Radio Station in the Navy Yard.

WESTERN UNION TELEGRAPH CO.

HARRY WEIDLER has been appointed superintendent of the fourth district, Metropolitan Division, Brooklyn, vice A. Simon, resigned to enter other business.

E. P. SHUTE, general supervisor of traffic costs, and H. P. Corwith, general inspector, both of Vice-President Fashbaugh's office, New York, are in the South on business connected with the service.

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Eastern Division

WILLIAM S. BROBST has been appointel manager of the Pottsville, Pa., office, vice Clarence E. Beyerle, resigned.

J. C. LYDDANE has been transferred from Washington to Pittsburgh as delivery supervisor.

MISS LULU FARNSWORTH, former manager at Bath, N. Y., has been appointed manager at Herkimer, N. Y.

WINTHROP VICTOR, formerly cashier at Mt. Vernon, N. Y., has been transferred to Superintendent W. A. Sawyer's staff, New York.

A RECENT thorough renovation of the Wilkes-Barre, Pa., office places it in the front rank for standardization and appearance. Rearrangements were effected whereby the customers' lobby was enlarged and the whole interior made more spacious. All old type desks were replaced by up to date double flat tops, two octette Morse tables were replaced by a sextette, and quartette telephone table replaced by a sextette standard table. New standard delivery desk and semi-indirect lights may also be included in the list of new acquisitions. Manager C. M. Burlingame and his organization are rightfully proud of their new home.

G. T. HARRIS, former district commercial manager in the fourth district, has been transferred to Pittsburgh as commercial agent on the staff of City Superintendent E. Ross Collins. W. J. Stead, former manager at Utica, New York, succeeded Mr. Harris in the fourth district with headquarters at Pittsburgh.

G. O. BENTZ recently resigned as district commercial manager in the fourth district to become associated with a coal concern at Huntington, W. Va.

New York Western Union

TWO HUNDRED AND EIGHTY-FOUR THOUSAND, SIX HUNDRED AND SIX unequated messages looks like a month's work for a large office, but including newspapers and the telephone department this is what the New York main office handled on December 24, 1920, breaking all records for any one day, and it was accomplished without the appearance of anything unusual. The total Christmas file was very much heavier than any previous year.

THE traffic department celebrated the holiday season with a tea dance given by the Recreation council. It was held at 24 Walker Street on December 29, 1920, in the rest room, which had been most effectively and artistically decorated.

The exhibition dances that were given by Misses Graham and Allen of the telephone department and by Mrs. Smith and Miss O'Brien of the statistical department were enthusiastically applauded. Prizes were awarded in the lucky number and one-step dances, which were won by Mr. Jermain and Miss Hennessy of the statistical department, Miss L. M Park and Mr. Haig acting as the judges. Refreshments were served and appropriate favors distributed. These helped to make the party one of the noisest as well as one of the most enjoyable that has ever been given.

THOMAS GALLAGHER, of Superintendent Haig's office, formerly sergeant of Company C, 102nd United States Engineers, was the recipient of a medal and citation presented by General O'Ryan at the Armory, February 8th, for exceptional bravery in leading a detail under heavy enemy fire, and laying a pontoon bridge across the La Salle River, in France, during the late war. Sergeant Gallagher's bravery is only exceeded by his modesty.

CHARLES DANFORTH, former night force chief, now retired, was a recent visitor to the operating department.

CHARLES FREDERICKS is spending his vacation at Lake George, and Arthur McGivens has just returned from his vacation.

THE commercial news department Bowling Team is still leading the league and is four games ahead of the other competitors, the treasurer's department and the cable traffic team.

FRANK D. MURPHY, aged sixty-six years, who has been identified with the operating department of the company since 1874, was killed by an automobile at Mount Vernon, N. Y., on his way to work on February 11th. Mr. Murphy was one of the best known figures in the operating room. He had done service in the main offices at 145 Broadway, 195 Broadway, and 24 Walker Street. He is survived by his wife.

Lake Division

GENERAL COMMERCIAL AGENT A. C. KAUFMAN, of Vice-President Willever's staff, New York, conducted a three-day session in development work at Chicago the week of January 17th. Managers of the first and third districts attended and received the business-getting ideas ably propounded by Mr. Kaufman.

DIVISION COMMERCIAL MANAGER J. L. FERCIOT, of General Manager Bradley's staff, Omaha, was in Chicago January 18th, 19th and 20th to attend the development meeting.

MRS. M. D. SCOTT, cable clerk in Superintendent Herbert Brown's office, and president of Chicago Local, No. 3, Association of Western Union Employees, has resigned to enter another field. W. H Nieman succeeds Mrs. Scott as cable clerk.

P. A. NUGENT, manager of a branch office, vice-president of Chicago Local, No. 3, Association of Western Union Employees, succeeded Mrs. Scott as president of the local.

WITH the completion of the cutover of the operating department to the new telegraph building at 427 South La Salle Street, Chicago, the old building at 111 West Jackson Street is almost devoid of life The delivery department only remains at this time, and its principal work will soon be lost to it by the transfer of message numbering, copying and service work to the new building.

WHO'S WHO, Volume 1, Number 1, printed in the interest of the telegraph service in Chicago, under the auspices of J. J. Welch, division traffic superintendent, reprints from the columns of TELE

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GRAPH AND TELEPHONE AGE the article entitled "Waste Not," by F. E. d'Humy. Mr. Welch considered the article valuable and timely.

MISS NELLIE M. BARRY has been appointed supervisor of receiving clerks, attached to the staff of the general manager's office, with headquarters at Chicago. Miss Barry is a tactful, courteous young woman of pleasing personality, whose training and experience in the several departments of the service at Champaign, Ill., and more recently at Detroit, Mich., have qualified her for the duties of her new position.

THE many friends of J. P. Smart, manager at Galesburg, Ill., were pleasantly surprised to learn of his recent wedding, the bride being Miss Martha Yeska, an expert telegrapher.

A. J. DUQUAINE, manager at Moline, Ill., was recently called home on account of the serious illness of his mother.

A RECENT reassignment of the third district places C. O. Kuhns in charge of offices in the northern half of Illinois and J. P. Glennan in the southern half of Illinois.

THE business men of Champaign, Ill., are generous in their praise toward the policy of the Western Union Telegraph Company. The local office has been completely transformed by the installation of an entire new front, hardwood floor with tile lobby, new fixtures and equipment, including one of the latest style pin-jack switchboards. The improvement has placed the Champaign office at the head of the list of first class offices in this section of the country. Under the efficient managership of Jack L. White, the office is steadily showing increases in revenue. With the installation of tickers, the office has assumed a metropolitan aspect. Considerable wire work is handled in addition to quad and repeater equipment. The personnel of the office is as follows: Manager, J. L. White; R. T. Finch, day operator; W. B. Church, night operator; cashier, Miss Mildred Munhall; bookkeeper and receiving clerk, Miss Mabel Blaisdel; chief delivery clerk, Miss Dorothy Stinson; night delivery clerk, Louis Casdorf; telephone and counter clerks, the Misses Alice Armstrong and Lauretta Deany and Mrs. Grace Newell.

MISS CHRISTENSEN, operator at Houghton, Mich., was a witness on the Arbutus case held at Sault Ste. Marie, Mich. Just before leaving Houghton she received the news of the sudden death of her mother.

MISS BEHLER, clerk at Houghton, Mich., was also summoned on the Arbutus case. The Arbutus case involves several of Houghton's prominent citizens being charged with bringing seventy cases of whiskey from Fort William, Ontario.

Cincinnati

A CABLE was received the other day from Germany, addressed:

WWE ELISE SCHMIDT
GEB SCHMEIZERLING
Cincinnati, O.

It is customary for the delivery clerks to consult with City Superintendent Scholl when hard nuts are to be cracked. We cracked this one "enconference." The "Geb" was the "nigger in the wood pile," and we decided that it meant "nee," and after consulting a linguist on the staff, found "geb" was the abbreviation for "geborne," meaning "born" in English. "WWE" meant "Mme," and we found a widow whose maiden name was "Schmeizerling" with very little trouble. Team work counts.

AFTER a very spirited election of officers of the Morse Mutual Benefit Association, comprised of Western Union and Postal employees, the following were elected: President, Frank A. Phelan; vice-president, L. F. Jones; secretary, H. T. Scoville; treasurer, J. W. Pons; executive committee—J. R. Pigman, J. F. Colligan, W. H. Keer, Phil Emig, Frank Diehl, F. A. Quinton, E. W. Leicht; auditing committee, T. F. Blackwell, H. J. Beckmeyer, and B. C. Chenal.

D. D. ROCHE, formerly manager at Granite City, Ill., was placed in charge at Tiffin, Ohio, vice W. E. Stone, resigned.

F. H. HOOVER has been appointed manager at Niles, Ohio, succeeding E. A. Densmore, who has resigned to enter other business.

E. J. FARIS, formerly manager at Portsmouth, Ohio, and now one of the numerous coal barons around Pomeroy, was a recent visitor at the office of Superintendent Montgomery, at Cincinnati.

MISS THELMA BURRIS, manager at Mt. Gilead, Ohio, has returned to duty from a month's absence due to breaking her arm. Relief Manager W. H. Pitzer has been transferred to Nelsonville, Ohio, vice Miss Nellie Benadum, resigned.

Philadelphia Western Union

J. S. W. PHILLIPS, who has been absent from duty for the past seven months on account of illness, is reported much improved. He expects to return to his office in a month or two.

GEORGE R. SCHULTZ, aged seventy-six years, manager of the Punta Rassa, Fla., cable station office for forty-eight years, until his retirement four years ago, died at that place on January 24th. He was a native of Newark, N. J., where he learned telegraphy at the age of nine years. Mr. Schultz was one of the best known telegraph managers in the United States. He was owner of a hotel in Florida, and his northern friends seldom failed to pay him a visit when in the vicinity of Punta Rassa. He was associated with Thomas A. Edison in Newark, N. J., in the middle sixties, and went to Florida in 1866 where he had since resided. Interment was at Elizabeth, N. J. He is survived by his wife, a son and a daughter.

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Canadian Telegraph Items

Canadian National Telegraphs

ON THE evening of January 26th the Arena at Ottawa was the scene of great enthusiasm when the Canadian National telegraph clerks defeated the Canadian National ticket clerks by a score of three to one, in a fast game of hockey.

W. J. PITFIELD, chief operator, Toronto, was presented with a nine and a quarter pound baby girl on January 18th.

CHAS. E. DAVIES, general traffic superintendent, and E. Kenward, superintendent of railway service, recently made an inspection of the railway telegraph facilities in Quebec and the Maritime Provinces.

JOHN CHRISTIE, who died at his home in Montreal on December 26th, 1920, at the age of eighty-four, was one of Canada's pioneer telegraphists. The deceased was born in Scotland, and when six years old he came to Bowmanville, Ontario, with his family, where they settled on a farm. In 1864 he entered the service of the Grand Trunk Railway, and during the next nine years occupied the agencies at Cobourg, Bowmanville and St. Lambert. He then affiliated himself with the Great North Western Telegraph Company as inspector at Montreal, Quebec, in which position he remained until retired in 1905. He is survived by three sons—Angus, Norman and Herbert—and one daughter, Mrs. C. A. Hutchison, of Montreal.

NAPOLEON SAUVE, of Sarnia, Ontario, after fifty-three years' service as lineman, retired on February 2nd. He assisted in building the first telegraph line between Dundas and Hamilton, removing to Point Edward in 1871 and residing there until the completion of the Sarnia tunnel, when he took up residence in Sarnia.

Phonograph Concert by Wireless 'Phone

The transmission of the music of a phonograph over the wireless by a Marconi wireless telephone aroused great interest in Toronto and was widely featured there recently.

Death of A. B. Smith

Alexander B. Smith, aged seventy-two years, formerly and for many years manager of telegraphs of the Grand Trunk Telegraph System, at Montreal, died in that city on February 6th. Mr. Smith retired from active service on account of ill-health in 1914. He had constructed the telegraph lines betwen Winnipeg and Prince Rupert in 1905. He began his business career as a telegraph operator for the old Montreal Telegraph Company, and was at one time superintendent of construction for the Great North Western Telegraph Company. Mr. Smith is survived by his wife, two sons and three daughters.

Ernest W. Clayton

Ernest William Clayton, agent of the Canadian Pacific Railway Company's Telegraphs, at Victoria, B. C., is a native of England.

Mr. Clayton entered the telegraph field at Stratford-on-Avon, his home town, where he was admitted by the post office authorities as a sorting clerk and telegraphist, in the year 1898. Remaining there until 1901, he then transferred his services to the telegraph department of the Government of the Cape of Good Hope, and, until the end of the Boer war, served as an operator at Dordrecht, in Cape Colony, and afterward completed four years of service in South Africa at Queenstown, Cape Colony, being regularly enrolled a member of the fixed establishment of the service.

ERNEST W. CLAYTON

Determining to strike out for what he considered a field of wider possibilities, Mr. Clayton decided to go to Canada, and he made his way thither via the African East Coast, the Red Sea, the Mediterranean, Italy, France, Portugal, Holland and England. In September, 1905, Mr. Clayton had qualified as an operator in the American Morse code, and was working in the Toronto office of the Canadian Pacific Railway Company's Telegraphs. In about a year's time he resigned to join the Temiskaming and Northern Ontario Railway, and was placed at Cobalt, Ontario, as station agent.

In January, 1911, Mr. Clayton succumbed to the call of the West, and rejoined the C. P. R., being appointed telegraph agent at Golden, B. C., very quickly to be transferred to Kamloops and again to Nelson, B. C., as agent. At Nelson he remained until June, 1916, when he was promoted to telegraph agent at Victoria.

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Montreal Telegraph Company's Annual Meeting

The Montreal Telegraph Company's annual meeting was held at Montreal January 14th. The report showed total assets of $2,315,487, of which $163,663 consisted of cash, accounts receivable, bonds and other securities, and the balance, of telegraph lines, cables, offices, equipment and real estate, in Canada and the United States. Dividends were paid during the year amounting to $160,000, and in addition a bonus of $5,000. The property is operated under lease for 97 years from July 1, 1881, by the Great Northwestern Telegraph Company, now the Canadian National Telegraphs. The directors for the current year are William McMaster, president; W. R. Miller, vice-president; R. McD. Paterson, H. G. Rawlings and F. W. Molson.

Telegraph Tax Ruling

The United States Commissioner of Internal Revenue has issued a ruling defining the originating point of a cablegram as the point where it is paid for. Therefore, the United States war tax will not be collected in the United States on collect messages destined to foreign countries, including Canada, but the tax will be collected on collect messages received in the United States from foreign countries, including Canada. The tax is based on the tolls paid, and not on the tariff rate for 10 words.

WHEN asked what would be the determining factor in selecting a vocation, were he a young man starting out in life, Thomas A. Edison declared a few days ago that he could not give advice on that subject, adding: "All that I do know is that if a young man has reached twenty-one and is dead mentally no amount of advice, example or experience will ever change him in the slightest. If at some period between twelve and sixteen years of age he can be interested in a subject and become enthusiastic, then he will advance and become a high type man. If not, then his mental machinery will gradually atrophy and he will be a mental dead one."

PROBABLY the two oldest telegraph operators in the State of Pennsylvania, are Colonel Joseph S. Green of Philadelphia, aged eighty-eight years, and Miss Elizabeth Cogley of Lewistown, Pa., aged eighty-eight years, both retired. Miss Cogley was the second female operator in the United States, Miss Emma Hunter of Westchester, N. Y., being the first to master the dots and dashes.

THE Postal Union Congress, which met at Madrid, Spain, in November last, transacted considerable important business, one hundred and sixty delegates, representing telegraph and post offices throughout the world, being present. The next Postal Congress will be held at Stockholm, Sweden, in 1924.

Every Telegrapher Should Have a Knowledge of Phillips' Code

Phillips' Code (*New Edition*). A thoroughly tested code of abbreviations arranged for telegraphic purposes and contemplating the rapid transmission of press reports; also widely used as an easily acquired method of shorthand. Revised and brought up to date, with supplement to February, 1920, by E. E. Bruckner, one of the most expert press code telegraphers in the country. The new edition contains about 700 additions to the older code, and is indispensable to the telegrapher who would become a *finished* telegrapher. Mr. Milton Garges, Chief of the Traffic Dept., Associated Press, New York City, in a recent announcement, following the abandonment of experimental operation of printer service between New York and Washington, said: "One way telegraphers can help themselves is by helping to develop Morse men." The standard of proficiency required by press associations includes a knowledge of Phillips' Code. Flexible cover, vest pocket size, $1.25 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

Jones' Book of Diagrams

The text-book of the telegraph profession, "Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, is by far the most popular electrical book on the market. This standard work has been carefully revised and brought up to date, and includes full descriptions of the newest apparatus adopted by the Western Union and the Postal Telegraph Companies. It presents the finest study of the telegraph ever published; it explains clearly the equipment of a modern telegraph office, and is a text-book that no student, operator, engineer, or official can afford to be without; 64 chapters, 488 pages, 250 illustrations. A new edition issued in April, 1918, includes an appendix of 24 pages, containing 16 illustrations, covering the new Western Union Multiplex System. Price $2.50 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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A Misunderstanding of Orders

A certain home in Hackensack was almost jolted from its foundation the other day when the wife of a telegraph test operator, glancing carelessly over some papers her husband inadvertently left on the breakfast table, found that they were his orders for the previous day and was horrified when she read the following:

"Go to 61 Broadway, cut off Logan's single legs, and make metallic duplexes of them."

"Wretch!" she cried, but her indignation gave place to amazement as she read on:

"Go to manhole at Broadway and Exchange place and send the two conductors you find tagged to 73 Broadway; there put solid ground on them."

"The poor fellows," she moaned.

Page two was a continuation of this awful tragedy:

"At manhole at Broadway and Rector Street you will find two conductors tagged "A" and "B." Leave them as you find them and tell splicer to close down manhole."

At this stage she dropped limply into a chair and read the last bit of evidence in this most amazing plot which was gradually unfolding:

"Go to Laidlaw's and see if there is any sign of escape on his Chicago legs. If so, cut them off and send them via good conductors to "N Y," then make necessary transfers, killing the other conductors between N. Y. and 26 Broadway."

The methodical manner in which each item had been checked off and the marginal note, "finished at 4 p. m.," showed that it was too late for interference. The cold-blooded villain had blindly done the work ordered by those "higher up" and "finis" was written. However, she would see justice done, and spare none.

There was a warm reception awaiting the aforesaid test telegraph operator when he reached home that evening and no dinner was forthcoming until he cleared himself of a charge of conspiracy, first degree murder, and unbelievable cruelty, by explaining that the "conductors" referred to were wires in a cable, and not the courteous, affable and polished conductors on the palatial trains of the Susquehanna Railroad, also, that "legs" in telegraph parlance are two single wires running to a ground at the distant end.

"Killing" and "cutting off" are not to be taken literally except by the initiated in the telegraph service.—*Hackensack (N. J.) Evening Record.*

C. S. RHOADS, superintendent of telegraph of the Big Four System, Indianapolis, Ind., recently sent a circular to all of his offices, for the attention of those interested in the telegraph department. The circular reads: "Permit me to call attention to the TELEGRAPH AND TELEPHONE AGE, as a splendid adjunct in keeping up to the times in telegraph and telephone matters. Their course in technical telegraphy now being published in this periodical is alone worth the subscription price, let alone up-to-date information as to the world news service in every respect. The subscription price is only $2.00 per annum, published on the 1st and 16th of each month, 253 Broadway, New York."

A VALENTINE dance was held by the Western Union Club at Rochester, N. Y., on February 5th. The arrangements committee consisted of Mary Wright, Gladys Hutchins, A. G. Wesson and Milton Ihrig.

Death of S. L. Burts at Atlanta, Ga.

Stephen Latimer Burts, division traffic superintendent of the southern division of the Western Union Telegraph Company, at Atlanta, Ga., died of apoplexy on February 12th. Mr. Burts was born in Abbeville County, S. C., in 1869, and learned telegraphy at Chester, S. C. Mr. Burts had passed through the various grades, such as operator, bookkeeper, and chief operator at Columbia, S. C., until 1896, when he was appointed manager at Charlotte, N. C. Mr. Burts became manager of the Atlanta, Ga., office in 1905, and became general inspector of the southern division in 1906, which position he held until 1909, when he was appointed to his present position. Mr. Burts was a popular official and his passing away will be mourned by a large circle of friends.

FRANK A. PICKERNELL, who was associated for many years with the American Telephone and Telegraph Company, a large part of the time as engineer of the long-distance department, died suddenly on February 12th at his home, in Englewood, N. J. He was fifty-six years old.

OUR readers should remember that when they have occasion to communicate with advertisers, it is important that they mention TELEGRAPH AND TELEPHONE AGE. The advertisers appreciate this courtesy.

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CONTENTS

Recent Attainments in Wired Radio. By R. D. Duncan, Jr. (Continued 98, 99, 100
Telephone Service in England 101
The Great Pre-War World Wireless Scheme of Germany. By E. W. Welch 102
May Connect Washington With Shanghai by Radio. A Good Investment 104
Student's Course in Technical Telegraphy. By Louis Casper 105
Thomas A. Edison Says. A True Prophecy 106
Mackay Companies' Annual Report. Universal Radio System Links Paris With Britain 107
Editorial Comment.—The Value of Courtesy. Large Gathering of Telegraph and Telephone Engineers 108
The Railroad—Semi-Automatic Sending Keys. Radio Expert Forecasts Transocean Telephony 111
Carrier Current Telephony and Telegraphy. By E. H. Colpitts and O. B. Blackwell 112
Radio Phenomena. Amateur Radio League Opposes Regulation Bill ... 113
Some Phases of Railroad Telegraph and Telephone Engineering. By Stanley Rhoads 114
Questions of Mandates and Cables Interwoven 116
Current Events.—Personal. Postal Telegraph-Cable Company 117
Western Union Telegraph Company 118
Radio Corporation of America. All America Cables 119
Obituary 120

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Recent Attainments in Wired Radio

By R. D. DUNCAN, JR.

(*Continued from page 76, February 16 Issue.*)

Further investigation along this line was made possible through the courtesy and co-operation of the New York Central Railroad Company. Through their general superintendent of telegraphs, Mr. E. C. Keenan, a pair of telephone lines running between New York City and Albany, N. Y., and two railway passenger coaches, stripped of their seats, were placed at the disposal of the Signal Corps. These cars were equipped with special and standard types of radio telephone and telegraph apparatus and auxiliary equipment, storage batteries, receiving and amplifying equipment, etc. An oscillograph was included as a part of the equipment of one car, for the purpose of studying telephonic modulation. During the actual field tests the two cars served as the abode of the members of the party. Views of the two coaches and an interior view of the coach which served as the fixed station are shown in Figs. 4 and 5.

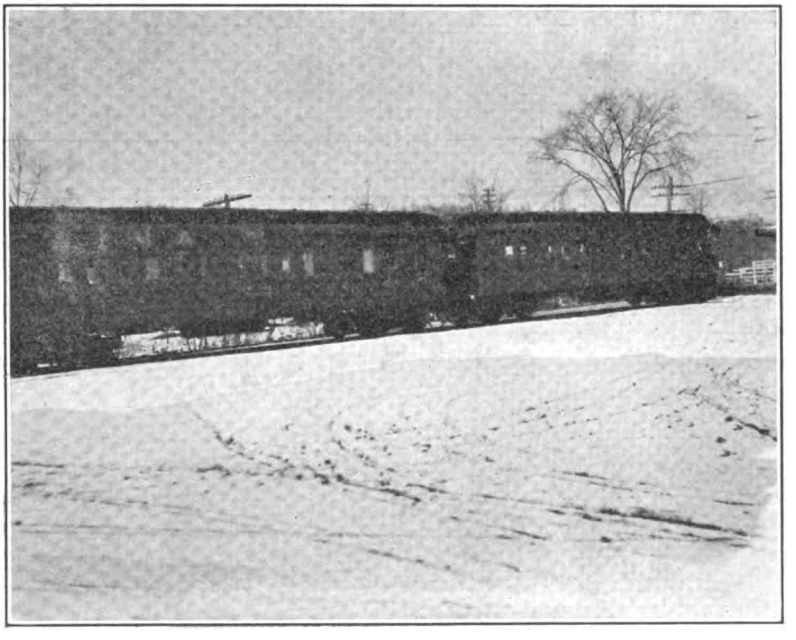

FIG. 4

Experiments on the New York Central telephone lines were commenced the latter part of 1919. They had as their primary object a study of the possibilities of establishing communication over fairly long sections of line when employing extremely high carrier frequencies. The electrical properties of the telephone lines when serving as the load on the radio frequency generator were also to be studied, since from the information thus obtained, artificial line loads might be constructed upon which the development of future transmitting and receiving equipment could be based.

The transmitting apparatus employed throughout these tests consisted of that shown in Fig. 1 (Feb. 16th issue), and, in addition, special experimental apparatus shown in Fig. 6.

Two arrangements of the special transmitting apparatus were employed, one in which the telephone lines were coupled directly to the radio frequency generator circuit and one in which the modulated radio frequency power was first amplified by a bank of vacuum tubes connected in parallel, and then fed into the line load. The generating and modulating apparatus is shown at the left in Fig. 6; the power amplifier is shown to the right. The diagram of connections of the generating and modulating circuit when operating alone into the lines and when serving as the "master" set of the amplifier equipment, is shown in Fig. 7.

The type VT-2 vacuum tube was used for transmitting, two operating in parallel, in both the generating and modulating systems, and from one to four tubes in parallel in the power amplifier. Plate voltage for operating the transmitting tubes of the fixed station was furnished by a motor generator set driven from 110-volt power lines; in the mobile car plate voltage was furnished by dynamotors operating from storage batteries. The transmitting apparatus was arranged for telephonic operation and for both continuous wave and buzzer modulated telegraph operation.

The method of connecting or coupling the line load to the radio frequency generating unit is novel and possesses several features which are of value in duplex telephony. One annoying source of trouble in duplex telephony is interference produced on the receiving apparatus by the stray electric and magnetic fields of the transmitter. Experiment has shown that the electric field may be confined to within known limits by shielding of the apparatus; the magnetic field, however, cannot be restricted by shielding and its disturbing effects may be minimized only by the proper design and displacement of the inductive and current carrying elements of the circuit. In the present circuit, energy is fur-

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nished to the lines through the means of a closed iron core transformer whose primary is connected, in series in the plate circuit, with the "frequency determining circuit." This transformer is designed to have a minimum magnetic leakage and its use permits of the further use of an inductance, in the frequency determining circuit, of a compact form which has a very restricted magnetic coupling field. The requirement for a minimum magnetic disturbance due to this inductance is equivalent to the requirement of a minimum value of ampere turns of the inductance effective at a given point in space. A theoretical consideration of this type of circuit shows that for a given frequency, and constant number of turns in the frequency determining inductance, the disturbing magnetic field will be a minimum and the line current a maximum when the ratio of the capacities interposed respectively between plate, grid and common negative point of filament is made large. When this is the case, the effective resistance of the frequency determining circuit is small and the major portion of the high frequency power converted by the vacuum tube is expended in the load. Experiment confirms these conclusions. The increase in ratio of the plate to grid capacities in this type of circuit, aside from other practical considerations, is limited by its effect upon the telephonic modulation; it was found that if carried to an extreme, the degree of modulation was considerably reduced. The iron core transformer is seen in the foreground of the photograph of the generator unit in Fig. 6.

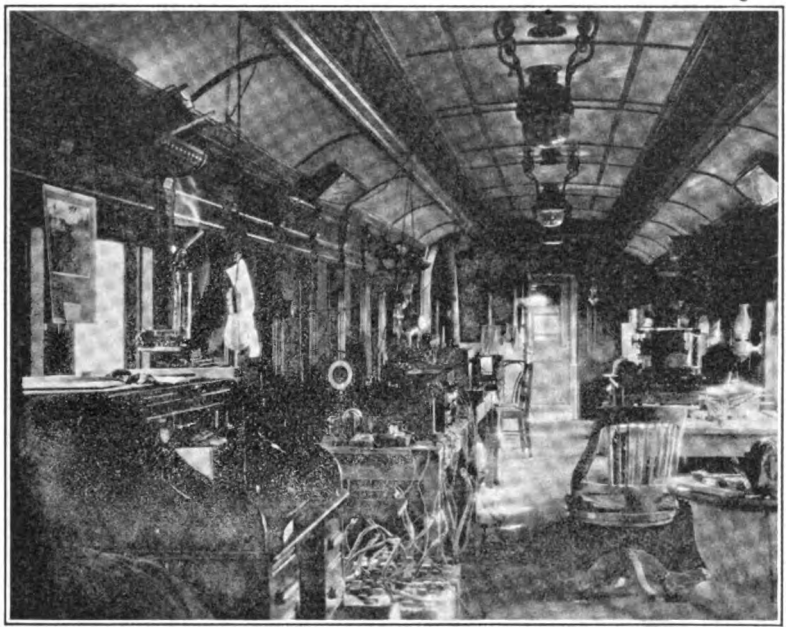

FIG. 5

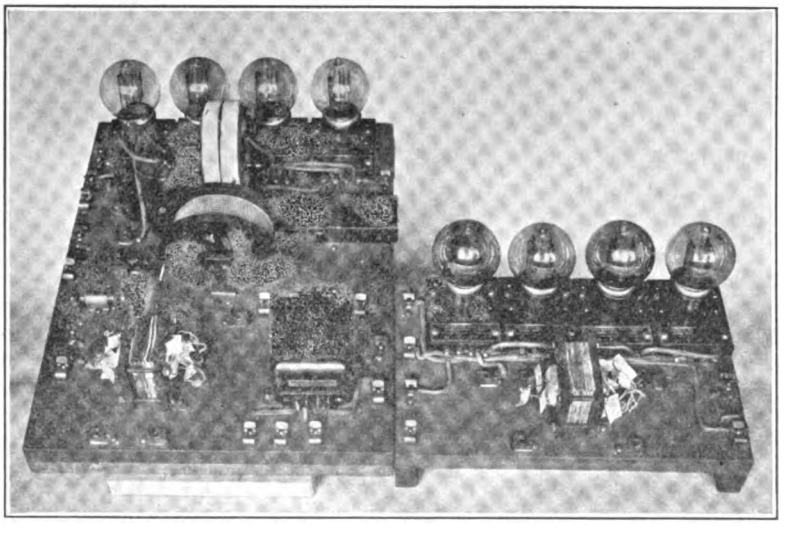

FIG. 6

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Oscillograms of the modulated high frequency output obtained from the generator, acting singly, and in conjunction with the power amplifier, are shown in Fig. 8.

The curves therein represent the envelope of the maximum amplitudes of the radio frequency currents, which are varied in accordance with speech frequencies; the straight lines about which the curves vary represent the unmodulated current. The oscillograms were obtained when the word "ah" was spoken into the microphone in a somewhat loud tone of voice.

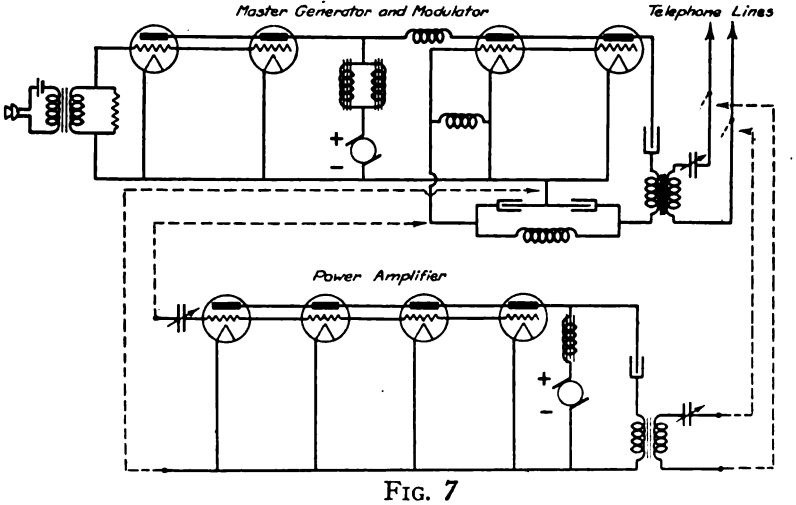

FIG. 7

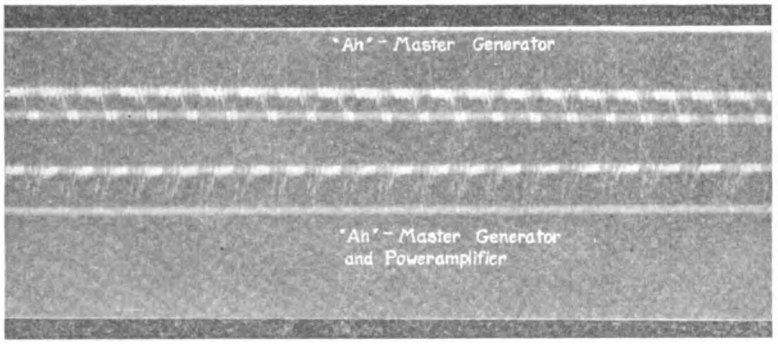

FIG. 8

The receiving equipment, shown in Fig. 9, consisted of a standard radio receiver and a two-stage audio frequency amplifier. The type *VT*-1 vacuum tube was used throughout.

One method of connecting the receiving apparatus to the telephone line is shown in Fig. 10. The apparatus employed in the later experiments was entirely experimental in character and was designed to obtain a high degree of flexibility in power output and in frequency. It was intended in no manner to represent a finished product.

In adjustment of both the transmitting and receiving apparatus, the lines were tuned to resonance by means of the series line capacity. The tuning, while not as sharp as obtained with a radio antenna, revealed a distinct resonant point, and could be made broad or sharp at will, by altering the magnitude of the loading or coupling inductance.

The transmission and reception tests were conducted on a pair of telephone lines running from New York City to Albany, N. Y., paralleling the Putnam and Harlem Divisions of the New York Central lines, and the Boston and Albany Railroad for a short distance into Albany. The lines were aerial throughout the length effective in these tests, and were transposed approximately every half mile; short lengths of overhead cable were included at three intermediate points where the lines entered stations for test purposes. These lines constituted the main telephonic channel of the New York Central Railroad between New York City and Albany and were in almost continuous operation. Besides being in ordinary telephonic operation, the lines were composited, each wire of the pair operating a Morse circuit to ground. Throughout the experiments no interference with either system was produced by the other.

Telephonic and telegraphic communication was established over the pair of wires from Elmsford, N. Y., just north of New York City, and Albany, N. Y., a distance of 130 miles. A good quality of speech and both continuous wave and buzzer modulated telegraph signals were obtained. The carrier frequency varied from 600,000 to 300,000 cycles per second (wave-length 500 to 1000 metres). The

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high frequency power output varied from less than one-half watt to twenty watts, depending upon the apparatus used. It is to be observed in this respect that when dealing with radio telephone circuits, in contradistinction to those used in radio telegraphy, an indication of maximum current into the load is not always indicative of most efficient operation. What is sought and that which is the most effective

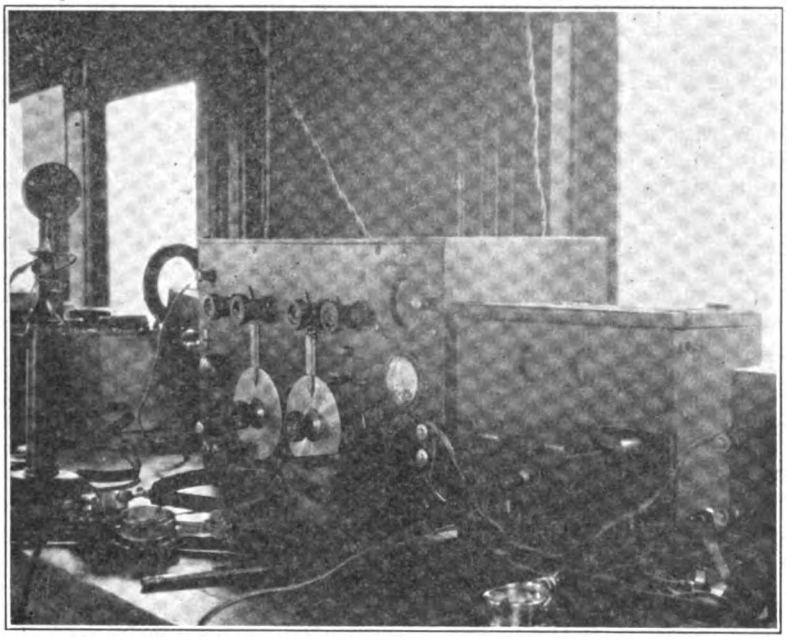

FIG. 9

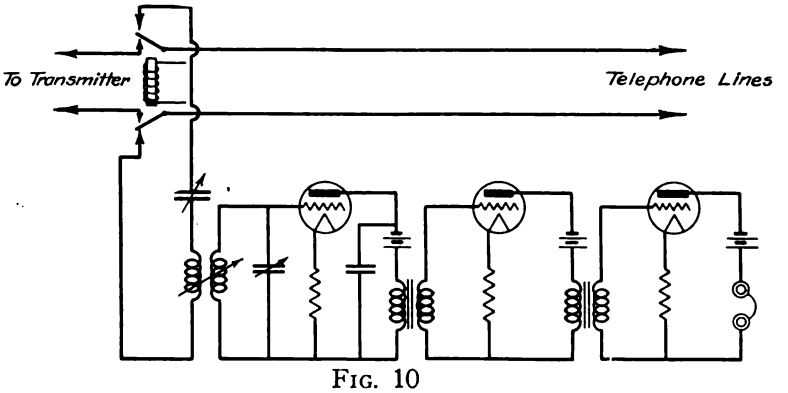

FIG. 10

at the distant receiving station, is the faithful and complete telephonic modulation of the power output that is available. A large power output incompletely or imperfectly modulated is no more effective than a smaller one more completely modulated and modulated with less distortion.

(To be continued)

Telephone Service in England

By agreeing in the House of Commons on February 18th to an investigation of the telephone system and the increased tariff, the English government managed to take the edge off an unpleasantly vehement protest. The telephone in England is a government monopoly under the Post Office, and a few weeks ago the Postmaster General announced a drastic raise in the rates, to take effect on April 1. This not only increased the rent of telephones and the cost of both local and trunk calls, but introduced a zone system into the London area, and, most unpopular of all, abolished the flat rate system for large users.

Immediately an extraordinary chorus of protest arose. It came from the people of all parties, and the newspapers, without exception, joined in it. The new charges were denounced as extortionate and unnecessary. If telephones were still under private management, it was urged, there would have been no need for these increases. Their sudden imposition, it was argued, without the consent of Parliament, was the crowning example of the bureaucratic tyranny under which England had been groaning since the war.

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The Great Pre-War World Wireless Scheme of Germany

By E. W. Welch

There is in the Archiv für Post und Telegraphie for August last a long article on the great wireless telegraph station at Kamina (Togo), which every German must have read with feelings of mingled pride and sorrow. Pride because national foresight and tenacity had enabled them to solve the problems of a new science and set up a great imperial service. Sorrow because by the war it had been swept away. Indeed, in the years to come all that will remain to Germany of that chain of stations linking up the solitudes of Africa with their own feverish life will be bitter memories, vain regrets and the silent pages of history.

In the article in question, which is by Dr. Roscher, director of telegraphs at Berlin, the whole history of the matter is dealt with in great detail. In it he describes how the authorities early realized that wireless telegraphy, more developed, might offer them the much desired power of communicating with their own colonies without the intermediary of foreign cables, and how consequently they set about the task of developing it and succeeded—and, also, what became of it.

The preliminary difficulties encountered were those natural to establishing stations in an undeveloped region, in situations far removed from coast or railway; then there were those due to violent weather disturbances, tornadoes, and electric storms. In the tropics the latter were almost of nightly occurrence and were a constant source of interruption until the Gesellschaft für Drahtlose Telegraphie introduced their Quenched Spark system. The advantage of this system over others is the production of a clear musical note which can be readily heard above the hissing sounds of atmospheric origin and, in fact, it was "due to this invention only that a chain of wireless stations was able to be set up in the German protectorates. These started in 1911 by the opening of the Muansa and Bukoba stations on the Victoria (Nyanza) in German East Africa. Then came a series of stations which linked up the vessels employed upon the African service with Swakopmund, Lüderitzbucht (German S. W. Africa), Duala (Cameroons), Daressalam, German East Africa, and Lome (Togo).

"Independent of this a network of wireless stations had also been created in the German South Sea possessions, the principal being at Yap in the German Caroline Islands, whence connection was obtained via the German-Netherlands Cable with the rest of the world. Still other stations were established at Rabaul (Gazelle Peninsula), Nauru and Apia (Samoa)."

All that, so far as it went, was excellent, but the great desideratum was to be able to communicate with Germany, with the big wireless station at Nauen, for apart from its evident commercial value in peace times, how immensely more valuable would it be in time of war!

But before that could be accomplished much research work had to be done, for roughly the distance was some 3,500 miles, and neither England, France, nor anyone else so far had bridged anything like the distance. And the problems before them were not to be solved by theoretic investigations or laboratory experiment, but only by experiment upon the spot. Such was the report of a committee which had been tackling the matter from as far back as June, 1908. When, therefore, this conclusion was at length arrived at, they set at once about experimenting. The main method adopted was to use two vessels of the Woermann Line, which during their sailings to and from the Cameroons endeavored to keep in touch with Nauen, the great German wireless station of the Gesellschaft für Drahtlose Telegraphie. The results were confirmed by further experiments with a vessel sailing for New York and others with Pola, the great Austrian station.

The experiments may be summed up in saying that they showed that the probable solution lay in greater masts for the antennae, greater current power and greater wave lengths.

That settled, the government in 1911, in the estimates, earmarked 200,000 marks for experiments on land. For various reasons, instead of the Cameroons, Togo was now chosen for the proposed big station, the actual site of which was to be Kamina, some four miles from Atakpame, the terminus of the Hinterland Railway. Here, at the experimental station which was set up, success crowned their efforts. "At last, on the night of the 7th of June, 1911," says Dr. Roscher, "after some two years trying, signals were picked up for five minutes from the great station at Nauen. But before this was achieved mast after mast had been destroyed by tornadoes, and when the first signals from Nauen reached them it was through a captive balloon some 450 feet up, as substitute. At the same time they also heard Poldhu, Cornwall, talking."

They were now ready to set up a proper station at Kamina. This task the government, who also wanted a station put up at the same time at Windhuk (S. W. Africa), confided to the Gesellschaft für Drahtlose Telegraphie, taking good care, so it would seem from the many contractual conditions, that they got ample return for the twenty years pecuniary assistance promised. Among the more important conditions were: that Nauen should be considerably enlarged, that Kamina should work at least four hours a day at the rate of seventy-five letters a minute, and that if atmospheric conditions prevented, they should in compensation during the next five days send and receive 1,200 paid for words of ten letters. The Kamina station, moreover, was not to "pass the efficiency bar" until it had done this for thirty consecutive days. And the smaller station being set up at Windhuk (German S. W. Africa) only when it had done 400 words of ten letters both ways for eight days. The government was to have seventy-five per cent. of all the charges paid on wireless telegrams in both Africa and Germany, to be able to send their own tele-

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grams at half price, to have right of pre-emption and control of agreements. Furthermore—most significant point—the Kamina and Windhuk stations were to be completed and ready within the 1914 financial year.

On the 20th of June, 1914, they were ready!

"When the English declared war" everything was ready. The station at Kamina, which is the only one that here concerns us, consisted of a forwarding house, high frequency room, collecting room, machine house, three iron masts of lattice work 225 feet high each, and six of 360 feet for the antennae, boiler house with two 500 H.P. turbines and two of 120 H. P., a residence for the director, a house each for the telegraphist and machinist, a 30 feet high water tower, workshop and a store containing spare parts of nearly everything. The wave lengths worked with to Nauen were by day 6,000m, and to Duala, a new station in the Cameroons, 2,500m; by night, 4,500m to Nauen and 1,600m to Duala.

Here it should perhaps be mentioned that at Nauen, in order to deal with the African service, apparatus producing 100 KW energy had been installed and a quenched spark sender with 100 KW in the antennae. As antennae supports one mast was erected 756 feet high and five others of 360 feet each.

Kamina was ready, the war was now on and the great station had to justify its existence and the confidence placed in its anticipated value in war time. This it is considered to have done extraordinarily well. It was due to it more perhaps than to anything else that so very little German shipping fell into enemy hands, for it was its warning calls that sent all German vessels within hearing flying for refuge into neutral ports. From enquiries made by the German War Ministry it appeared that wireless calls had thus saved some 800,000 tons of freight room. The Hamburg-American Line alone reported that it had saved them 47 vessels with a total of 287,237 gross tonnage and a value of 93.3 million marks.

The next great use of Kamina was to act as a kind of transmitting centre for everywhere after the enemy had blocked the ordinary channels and acquired the German cables. Thus telegrams from western Europe for Berlin reached their destination via Spain-Teneriffe-Monrovia-Lome (via the cable of the German South American Telegraph Company) and then by wireless via Kamina to Nauen. "By arrangement, also, with the Pernambuco cable station no inconsiderable part of the South American traffic on hand there for Germany was forwarded via Lome-Kamina." It served also for a service in one direction only to German East Africa and proved, too, a most advantageous means of forwarding important official despatches to Duala and Windhuk, and the extra work resulting from the presence at Duala of the much-talked of "Kamerun" lying in the entrance to the port. The actual amount of work disposed of during August, 1914. was 152 telegrams of 4,511 words, received in 2,998 minutes from Nauen and 77 telegrams of 1,828 words sent. Practically all telegrams were in code. The best working hours proved to be from 1 to 4.30 A. M. and 8 A. M. to 1 P. M.

The Eiffel Tower Wireless Station, it appears, used to endeavor to annoy Kamina, and Kamina, when it could spare the time, returned the compliment, extending its annoying assiduities to English warships and coast stations.

And now what was to be done? Kamina itself was in danger, for the governor of the English Gold Coast Colony had refused to agree to neutrality. Not only were there attacks by the English to be faced, but the French were advancing from the direction of Dahomey. The Togo Protectorate troops had arrived to defend it, but whilst 6,000 were considered necessary, only some 150 Europeans and 400 natives were available. Then a field telegraph station had to be organized to set up new and link up existing telegraph and telephone stations along the probable lines of enemy attacks. By the 19th of August, 1914, they had managed to connect up some eight stations with Kamina, having a hundred miles of line between them, and cycle connections with outposts from terminal stations.

The actual work of laying these new lines was full of difficulty. It had to be done in great haste by Europeans who were novices, aided by a native transport gang that had grown nervy and indifferent. The available apparatus was equally nondescript. The whole thing may be likened to a superintending engineer's nightmare following a big storm and a bad whiskey. They laid the lines almost anywhere and almost anyhow. They laid them over limping poles and unlopped trees, through grass as high as a man on horseback; over fallen trees, great stones and labyrinthine tree roots and a lot of the way the bare bright wire was laid along the ground. Added to this the natives, when they tired of their burden, used to throw down the wire and disappear into the bush. Then came unceasing tropical rains, and these together with bad commissariat conditions made the whites at last bad tempered. And no wonder! Still the line was laid, and—it worked.

All these lookout preparations were mainly to enable the defenders to time with precision the moment when the defense of the great station being no longer practicable they themselves should proceed hastily to destroy it.

The war had been on barely a month before the necessity arose. Faced with this inevitable and disagreeable duty, the commandant asked Berlin what he should do, and Berlin, animated by a like desire to share responsibility, said: "Use your own judgment, but so important a station should in no case fall into hands of enemy undestroyed."

There is something about this transaction which is reminiscent of the Babu who telegraphed to headquarters: "Tiger eating stationmaster; please wire instructions."

At all events very severe fighting had now been going on at Ehra, only thirty miles away to the south, where the enemy, greatly superior in force,

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had again been held up, and it is alleged badly punished. But he was closing in rapidly all the same. The station had to be destroyed, but only at the very last moment, and the difficulty was to determine, as the destruction would take four or five hours, when precisely to begin. Kamina had not only to be destroyed beyond the possibility of repair, but also destroyed so thoroughly that the enemy could learn no constructional secrets.

It was now the 27th of August and it was evident that the moment of destruction could no longed be deferred; it must be done that night, for English outposts had been prowling round in close vicinity and at any moment a rush might be made. There was much to be done, as will be imagined, for the station was extensive, and besides the buildings and material there were nine high masts to be destroyed. At dark they would begin.

Night came down. The officer in charge took up position at the engineering house, where he could keep in touch by telephone with the destruction parties.

The steam hooter gave the signal. The Evacuation Police having cleared the danger area, the receiving antennae were let go and, falling, were cut up. Next the "exploding" party destroyed the receiving and machine houses, smashing or blowing up everything. All documents and papers were burnt.

Next the sending antennae were let go at several points, and on falling also were cut up.

Finally they proceeded to overthrow the nine towering masts by loosing the couplings at the foundation blocks. Like a row of gigantic ninepins they went down, one after another, with a terrific metallic ringing noise, heard, it appeared later, far away in the silence of the night.

All that remained of that great station which had worked for only a month and had cost such years of toil and ingenuity to bring into existence, of that station which had represented a long passing beyond the work of other nations, was now a maze of crumpled ironwork and chaotic ruin. It had gone down a sacrifice to war. Still it can justly be said to do honor to those who planned it, that, is, from the point of view of scientific achievement. Of other objectives connected with it the less said the better, except that, happily for civilization, they have ignominiously failed. But thinking of it simply as a great human effort it is worthy of admiration. Of it Dr. Roscher himself says: "In spite of the fateful causes which made its effectiveness of so brief duration, the great wireless station at Kamina will rank for ever as a mighty landmark in the development of the commerce of the world." To many it may be so, but to others it is but the symbol of a world power that was not to be.—*St. Martins Le Grand.*

May Connect Washington With Shanghai by Radio

The radio plant which the Federal Telegraph Company intends to erect in China, according to detailed information received by the State Department at Washington, will be powerful enough to make possible the sending of messages direct from Shanghai to San Francisco, and possibly to the Arlington station in Washington. This would enable the United States, in emergencies, to free itself from the use of commercial cables.

This is one of the reasons which have prompted the Government of the United States to take the unusual course of informing the Chinese government that cancellation of the contract by China would be regarded as "an unfriendly act."

The contract with the Federal Telegraph Company of San Francisco was signed by the Chinese government on January 8th. It provides for the erection of the main powerful wireless station at Shanghai, with substations at Canton, Peking and Harbin, at an approximate cost of $4,200,000.

It is understood that the Japanese are joining with the British in bringing pressure to bear on the Chinese government to cancel this contract, on the ground that it conflicts with a previous one, granted by the Chinese Navy Department, to the Mitsui Bussan Kaisha, a Japanese concern.

While the Japanese are joining the British in opposing the American contract, the Japanese and the British are also in collision with each other. The Japanese addressed an inquiry to the Chinese government last December, on the subject of the monopolistic contract awarded the Marconi, the British concern. In answer to this inquiry, the Chinese government explained that the contract with the Japanese concern related to communications with the outside world, while that of the British company was limited to domestic communications.

The plants which the American organization intends to build are to be operated under joint Chinese-American control, and, it is understood, are to be turned over to the Chinese at the end of ten years.

A Good Investment

We saw it announced, recently, that twenty million dollars in nickels were dropped in the slots of pay station telephones throughout the United States during the first ten months of 1920, and it was graphically explained that these nickels, if placed edge to edge, would reach from New York City to San Francisco and then a thousand miles into the Pacific Ocean.

This is fine for the telephone companies, but, FOR US, an interesting item is that forty nickels, placed edge to edge, will reach but about thirty-four inches, and, if sent to us, will pay for the TELEGRAPH AND TELEPHONE AGE anywhere in the United States, Mexico, Cuba, Porto Rico, Canada and the Philippine Islands for one year.

Tell this to your friends; then send in their subscriptions.

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Student's Course in Technical Telegraphy

By Louis Casper.

Lesson 22

In the previous lessons exemplifying the various methods of wire testing by Wheatstone bridge measurements, the symbols L^1, L^2 and L^3 are made without special reference to designations shown in any of the telegraph companies' specifications or other published description. The symbols as shown are merely made for convenience and uniformity of illustration, and will follow in the same order throughout the lessons which are to follow.

Locating a Cross by Voltmeter Only

Many telegraph offices are not equipped with a Wheatstone bridge, but are supplied with voltmeters. If a voltmeter is of high resistance, a fairly approximate and very simple test for a cross between two wires may be made. Such tests would not, of course, be as accurate as a bridge measurement, since they are subject to earth currents or "ground potential" variations. In such cases where the ground return is steady, the test may be considered fairly dependable and might prove valuable in an emergency.

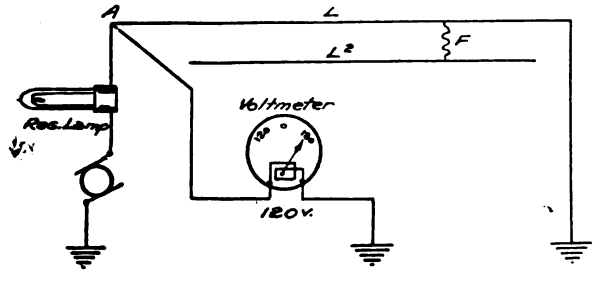

FIG. 49

By referring to Fig. 49, it will be seen that the voltmeter taps the line L^1 at the point A, which is between the battery lamp resistance and the line L^1 which is grounded. The line L^2 is left open as shown. If the voltmeter reading at the point A is found to be 120 volts, it must be assumed that from there a gradual drop of potential will occur along the line L^1 until the terminal or ground is reached, where it will finally fall to zero. This, of course, assumes that there is a neutral ground between the testing and distant stations.

The voltmeter is then connected to line L^2 as shown in Fig. 50, and the drop of potential noted on the voltmeter. If, for example, the reading is now 80 volts, then the fall of potential from 120 to 80 volts at the fault F would indicate that it has dropped through two-thirds of its value between A and the distant ground.

If we assume the distance between A and G to be 50 miles, then, basing the calculation on the fall of potential as shown, the distance between A and F is 16⅔ miles.

Reduced to a formula we have:

$$\frac{(V - V^1) \times L}{V}$$ in which

V = Voltmeter (1st reading)
V^1 = Voltmeter drop (2nd reading)
L = Length in miles

The accuracy of this test is somewhat affected by the ratio the resistance of the wire L^2 between the fault F and the voltmeter bears to the resistance of the voltmeter itself. If, however, the voltmeter resistance is very high, any error from this cause would be slight.

Localization of "Breaks" or "Opens"

The various tests shown so far cannot be applied to a broken or "open" wire. It is not possible to obtain a reliable location of such a fault on a wire looped back to a good wire.

There are several methods in which a break may be localized. The success of these tests very largely depends on the knowledge and experience of the wire chief handling such lines. In most cases a broken wire becomes crossed with another wire which is intact, and a location of the trouble can be made on the latter.

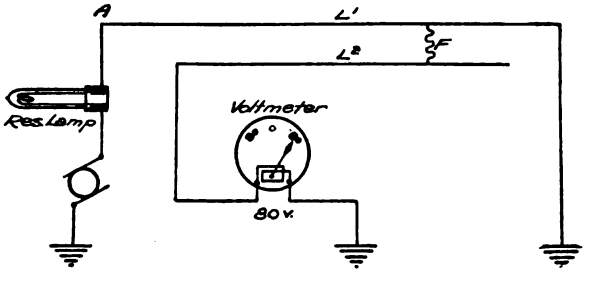

FIG. 50

When two wires break and their ends become crossed together without touching any other wires it is often possible to apply the Varley loop measurement shown in Lesson 20, because one or both of the broken wires usually make a contact with the ground, which will serve in place of the regular ground at the distant station. (See Figs. 44 and 45, Lesson 20.)

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In the event the break is entirely insulated or "dead open" the location must be determined by a capacity or insulation test. By reason of the difficulties in securing accurate measurements of capacity on aerial lines, due largely to the presence of induction from parallel working circuits, localization by this method is not an easy one. Detail records from the different telegraph test offices throughout the country, however, show that in spite of the deterrents mentioned, a large proportion of "breaks" or "open" faults have been accurately located by means of the capacity or "static kick" test.

This test may be applied with either a voltmeter or a Morse relay testing set, the former being preferred and most generally used at the present time.

As a general rule, a record is kept of the capacity of such lines as are maintained by wire chiefs in their respective testing territory.

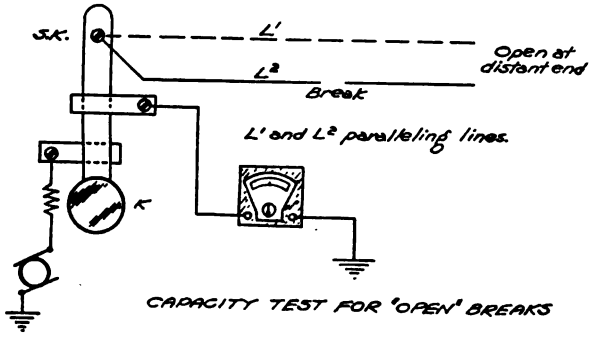

FIG. 51.

The capacity of a wire may be ascertained by means of an arrangement similar to that shown in Fig. 51. When the knob K of the strap key SK is depressed, a charge is sent into the open line. When the key is released, the charge is discontinued and the line discharges in the opposite direction to the charge. This discharge passes through the back contact of the strap key to the voltmeter and thence to the ground.

The result of the charging and discharging of the line causes the voltmeter to be deflected to one side or the other of the zero mark at the center of the Vm scale. By comparing the amplitude of the throw of the voltmeter from a good line with that from the wire on which the fault is to be located (assuming, of course, that both wires parallel each other), the relative capacities of both wires can be compared, the good line having a greater proportion of capacity than the broken wire. For example, if the Vm throw from the good line (L^1) is 100, and the faulty wire (L^2) indicates 50, it is obvious that the distance to the fault is

$$\frac{50}{100}$$

or half the entire length of the line.

(To be continued)

Thomas A. Edison Says

The world is fine and interesting, but somewhat complicated. It is progressing and moving along, faster than ever.

We have more knowledge and tools now and can go head more rapidly on new inventions.

What we need is more men of imagination.

Unemployment is psychological, but is part of a cycle, and must work itself out.

The trouble with a man, seventy years or over, is that he doesn't take an interest in many things unless he has been mentally active in his early days. If he has been mentaliy active, he will find plenty to occupy his mind, such as reading, observing and watching people. There are so many hobbies to work with that he can have a good time until he dies.

Men wear out their machinery. If they like eating they overdo it one hundred per cent. If they like drinking, it's the same thing, and even if they like sleeping, they overdo it.

If the ordinary man should retire at seventy, he would be dead in three years.

I don't want to retire until the doctor comes with the oxygen tank.

A True Prophecy

Daniel Webster in 1849, when the electric telegraph was new, wrote to the governor of Massachusetts as follows:

"If writing and sending were as ready and easy as talking and shaking hands, these morning salutations of friends would be equally pleasant on paper. Perhaps electricity will help us to the means of all this yet."

S. O. S!

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Mackay Companies' Annual Report

In the fiscal year ended January 31, 1921, the Mackay Companies, a holding corporation for the Postal Telegraph-Cable Company, the Commercial Cable Company, and affiliated concerns, brought London and New York into direct communication by cable without relays, without sacrificing any advantages of the old method of operation and with distinct advantages of the new, according to the annual report made public on February 15th.

Income from investments amounted to $4,868,986, compared with $5,021,095 in the preceding year, while its operating expenses, including taxes, totalled $535,400, against $644,884. Dividends paid totalled $4,230,336, compared with $4,355,988 in 1919, and the final surplus was $103,252, against $20,223.

"The position of the companies," Mr. Mackay said, "continues to be one of great strength. The gross receipts and net profits of the cable and land line systems, while not so great as in the preceding year, are nevertheless very satisfactory. During the year the cable system was maintained in excellent condition and transmitted a volume of traffic greatly in excess of any pre-war year, and the prospects for a continuance of a heavy volume of cable business seem assured.

"Particular attention has also been paid to the continued development of the long distance telephone service, operating principally in the South, Southwest and on the Pacific coast. One hundred and fifty-four cities and towns are now reached by that service and approximately 40,000 miles of wire are utilized and provided for its use.

"The long distance telephone service is conducted over wires which simultaneously carry telephone and telegraph traffic, thus creating a by-product from our present facilities. This, of course, makes the investment nominal and enables us to give the service at rates lower than those charged by other telephone companies. The increase in revenue from that service in 1920 was approximately 35 per cent. over that of the previous year.

"The value to the land line system of the extension of this long distance telephone service is very great, and in order that that branch of the business may be properly fostered, a special department has been created to have particular charge of its development. Great possibilities are seen not only for developing a country-wide long distance telephone service, with a practically nominal investment, but also for its collateral effect on our telegraph business, and it is proposed gradually to extend to all the important centres in the United States, including New York City."

The construction of a new cable repairing steamer to replace the present cable ship *Mackay-Bennett* has been ordered. The new steamer will be completed early in 1922. It will be an oil burner of 360 feet in length, and will be fitted with the very latest machinery for cable repair work and will be the last word in a ship of that class. It will be named the *John W. Mackay,* in memory of the founder of this system.

In the past the Commercial Cable Company has depended on chartered cable repair steamers to make repairs of its cables off the Irish, English and French coasts. This has resulted at times in delay, due to the inability to secure such ships when they were needed, and it was, therefore, deemed advisable to purchase an additional vessel, which has been converted into a cable-repairing steamer, to make all repairs to the cables in the localities mentioned. In this way the company will be enabled to make repairs independently of chartered vessels and consequently with greater facility. This steamer has been named the *George Ward,* in honor of the vice-president and general manager of the Commercial Cable Company, who has been so closely identified with the companies since their inception.

The land line system during the year expended large sums in the extension and reconstruction of its lines, all of which were paid for out of earnings.

William W. Cook, a trustee, and general counsel of the companies, resigned during the year. Mr. Cook was one of the organizers of the Mackay Companies, and his resignation was accepted with regret. The vacancy in the Board of Trustees was filled by the election of the Hon. Frank L. Polk, until very recently Under Secretary of State of the United States.

At the annual meeting of the Mackay Companies, held in Boston on February 15th, Morton S. Paton of New York was added to the Board of Trustees. The following trustees were unanimously re-elected: Clarence H. Mackay, Charles H. Sabin, Lewis L. Clarke, Hon. Frank L. Polk, Sir Edmund B. Osler, Sir Thomas Skinner, George G. Ward, Edward C. Platt, George Clapperton, Milton W. Blackmar and William J. Deegan.

Universal Radio System Links Paris and Britain

A linking up of wireless and telegraph systems by which wireless communication with Paris will be made universal has just been completed in London. It is now possible to hand in wireless messages for Paris in any postoffice in the United Kingdom and have them transmitted at a rate of five cents a word.

The linking up is done without relays, as the working of the telegraph key in Paris sends the message automatically over the land wire, transmits it to the air and ultimately joins the land wire again, operating the receiving station at the Fenchurch Street office in London.

Many other new wireless developments are being made. Recently the foundation stone of what will be the most powerful radio station in the world was laid at Sainte Assise, France. It will be able to communicate with America, the Far East and Australia.

THE word "Please" sent in telegrams cost the public a good many thousand dollars each year.

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EDITORIAL COMMENT

The Value of Courtesy

An official recently addressed his subordinates on the question of courtesy, and it seems to us that what he had to say is worth repeating, for the reason that he discusses the subject from a different angle to what we are accustomed to read. His message was as follows:

"I have no doubt that each of you, some time in life, has sought for information, from the policeman, the newsboy perhaps, the salesman, the passer-by or others, information which might enable you to readily locate some place with which you were not altogether familiar or to complete intelligently some personal matter which you had undertaken.

"I dare say that at such time your mind was absorbed upon your particular subject to the exclusion of all else, and you felt that everyone should be in harmony with you, and that you had every right to call upon the universe to assist you.

"And did you ever have the misfortune to make inquiry and receive a response that stunned you for the moment, because of its indifference, lack of information and general discourtesy—especially so when your inquiry could have been fully, satisfactorily and pleasantly answered without additional expense in time and energy? To say the least, your feelings were hurt, and, therefore, you were hurt, as, after all, no man can hurt you more than to hurt your feelings.

"As an employee, you are familiar with your work. It is a business of multitudinous detail, of which our patrons do not, nor are they presumed to know, and, therefore, seek our advice; and they have every reason to expect a courteous and full response.

"In fact, they have an undisputed right to receive it. They purchase what we sell, service, and we should see that they know how to use it successfully. What may seem so unimportant to us may be of great concern to others and, therefore, the greatest care should be given to respond correctly, courteously and completely, even to the extent of affording a little more service than might ordinarily be expected or required.

"To do so, cannot help but give the world a better opinion of us, as a company and individually.

"To do otherwise, gives pain and disappointment and labels us 'a grouch.'

"To make others happy, by being courteous, costs us nothing. As a matter of fact, it pays a big return in that it makes us the happier."

—o—

LARGE GATHERING OF TELEGRAPH AND TELEPHONE ENGINEERS

At the midwinter convention of the American Institute of Electrical Engineers, the afternoon session, February 17th, was assigned to the Telegraphy and Telephony Committee for the presentation of papers.

Two important technical papers were presented: one by Messrs. E. H. Colpitts and O. B. Blackwell on the subject "Carrier Current Telephony and Telegraphy," and one by Stanley Rhoads on "Some Phases of Railroad Telegraph and Telephone Engineering."

Both papers are thoroughly complete in their respective subjects; both in text and illustration.

President Berresford of the Institute opened the meeting and then turned it over to Donald McNicol, chairman of the Telegraphy and Telephony Committee, who introduced the speakers and conducted the discussion.

Among those who discussed the papers and presented contributory matter were: Major-General G. O. Squier, chief signal officer, U. S. Army; Dr. A. E. Kennelly, of Harvard University; H. W. Drake, Western Union Telegraph Company; H. M. Turner, Sheffield Scientific School; E. C. Keenan, general superintendent of telegraph, New York Central Lines; Charles E. Davies, general superintendent of traffic, Canadian National Telegraphs, Toronto, and John L. Niesse, of the Big Four Railroad, Indianapolis, Ind.

About four hundred and fifty telegraph and telephone engineers were present at the meeting, among whom were Bancroft Gherardi, chief engineer, American Telephone and Telegraph Company; E. B. Craft, assistant chief engineer, Western Electric Company; George D. Perry, general manager, Canadian National Telegraphs; George A. Cellar, general superintendent of telegraph, Pennsylvania System; Sterling Morton and J. O. Carr, of the Morkrum Company, Chicago; J. P. Edwards, assistant to vice-president, Western Union Telegraph Company; J. H. Bell and A. J. Eaves, telegraph engineers, Western Electric Company; Arthur Bessey Smith, Automatic Electric Company, Chicago; L. Behner and W. M. Post, superintendents of telegraph, Pennsylvania Lines; Dr. L. M. Potts, Western Electric Company; A. Reiber, Kleinschmidt Electric Co.; A. R. Belmont, telegraph and telephone engineers, Boston and Albany Railroad; Erich Hausman; Lloyd Espenschied, American Telephone and Telegraph Company; J. W. Milnor and G. R. Benjamin, Western Union Telegraph Company; J. J. Ross, superintendent of telegraph, Michigan Central Railroad Company, Detroit; E. Kenward, superintendent telegraphs, Canadian National Railways, Toronto, Ontario; J. D. Jones, superintendent telegraph and signals, Pennsylvania System, Philadelphia; L. D. Shearer, superintendent telegraph, Reading System, Pottsville, Pa.; L. H. Jenks, superintendent, Northwestern Telephone Corporation, Carthage, New York.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

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As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

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For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

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Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

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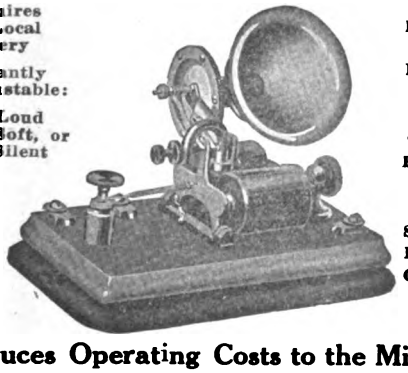

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More than 100 Railroads, Pipe Lines and Oil Companies have proved that Diaphragm Sounders give better service—longer, and at less expense than any other type of sounder.

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THE UNIVERSAL SELECTOR FOR TELEGRAPH AND TELEPHONE

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THE RAILROAD
TELEGRAPH AND TELEPHONE

J. B. MACGREGOR has been appointed assistant superintendent of telegraphs of the Western Lines, Grand Trunk Railway System, with headquarters at Battle Creek, Michigan.

MANY of the railroad officials complain that pole lines along the railroads are overburdened with a large number of wires, which seem to be necessary in the operation of the railroads and for commercial purposes. If the development of the wired radio known as the "Carrier Current, Telephony and Telegraphy," fulfills expectations, as it now gives every promise of doing, as suggested by Major-General Squier, of the Signal Corps of the United States Army, it will be the solution of the problem. One pair of wires could be used for at least thirty different purposes; that is to say, one pair of wires would furnish the ordinary Morse telegraph service, the ordinary frequency telephone service, and, in addition thereto, by means of the high frequency current employing wired radio waves at different high frequencies stepped up about one thousand cycles apart, there would be obtained as many additional telegraph and telephone circuits as may be required for all purposes. This was clearly brought out at the discussion of Messrs. Colpitts and Blackwells paper at the meeting of the American Institute of Electrical Engineers, New York, on February 17th.

MAJOR-GENERAL GEORGE O. SQUIER, chief signal officer of the United States Army, Washington, D. C., has probably done more than any other single individual in pointing out the advantages to be derived from the Carrier Current system.

Semi-Automatic Sending Keys

J. E. Albright, general manager of the Vibroplex Company, New York, writes us as follows:

"I note your article on page 83, February 16th number, regarding semi-automatic sending keys. The railroad committee having the matter in charge have brought out several good suggestions, but they have overlooked the most vital part of the sending machine, namely, the contact points. During my many years' experience with sending machines, I have found that most of the trouble incident to working these machines is caused by worn-out contact points, found on machines that have been sent in to me for repairs. I have noticed a number of cases where contact points that we furnish with the sending machines have been substituted with an ordinary piece of wire. It seems to me that if this was taken up with the committee and a good article published drawing attention to the contact points, it will develop a high standard of proficiency for sending machines.

In regard to the recommendation of the committee that the cords should be made of stranded wire, I would say that all of our cords are made of stranded wire."

Vibroplexes, like all other telegraph instruments, are constantly being improved.

The Old Style Single Lever Vibroplex, that for the past twenty years has given such general satisfaction, from the standpoint of efficiency, has lately been improved by the manufacturers. A new trunion lever replaces the old style lever, and it is said that the instrument works more satisfactorily. Another improvement is the reduction of the weight of the machine a little over a pound, which makes it more desirable when it is to be carried from place to place. The base of the machine has been reduced in size and the rubber feet have been placed on the base, where they grip the desk in such a manner as to make the instrument rigid and solid.

Radio Expert Forecasts Transocean Telephony

Professor Alfred N. Goldsmith, in charge of electrical engineering at the College of the City of New York, made a prediction of transocean telephony on February 17th, at the City College laboratories, and backed it up by laboratory demonstrations.

The radio expert treated his interviewers to some radio telegraph signals from the Nauen station, near Berlin, which literally filled the room with sound, and permitted them to listen to jazz music from a station at Elberon, N. J., which was about twice as loud as the original phonograph which emitted it. He explained that the operator on the steamship *Gloucester,* an experimental ship then steaming off Long Island, had recently talked to the Elberon experimental station, where his voice had been transferred to the transcontinental telephone line ending at Los Angeles, where it was shifted once more to the ether and carried to Avalon, on the island of Catalina.

"The time is not far distant when any telephone subscriber will be able to reach ships at sea or possibly even telephone subscribers on the other side of the ocean," said Dr. Goldsmith, as he explained that recent progress in wireless was due to the audion, a vacuum tube somewhat resembling in shape an ordinary electric light bulb, invented by Dr. Lee De Forest and since improved by many other experimenters. It is known as an amplifier and can take extremely feeble speech or signals and raise them to extremely loud tones.

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Carrier Current Telephony and Telegraphy

At the Ninth Midwinter Convention of the American Institute of Electrical Engineers, held in New York, on February 17th, a paper on "Carrier Current Telephony and Telegraphy," by E. H. Colpitts and O. B. Blackwell of New York, was read.

This paper briefly outlines first the history of the development of carrier multiplex telegraphy and telephony. The fundamental principles underlying particularly the newer developments of the art are then discussed. Consideration is likewise given to the propagation characteristics of open wire lines, including those containing intermediate lengths of cable. Commercial types of apparatus and actual installations are then described and a brief statement made as to further applications of the art.

The carrier method of multiplexing telephone and telegraph lines is technically one of the most interesting and important of the developments which have been perfected in the art of electrical communications during the past few years. In this paper we are giving a brief sketch of the development of this art, an explanation of the principles on which it is based, and a description of the applications which have been made in the plant of the Bell Telephone System.

In a carrier multiplex system, a number of separate telephone, telegraph or signaling messages are superimposed simultaneously on a single electrical circuit by employing a separate alternating current, usually called a "carrier current," for each of the separate messages. This carrier current is made to vary in accordance with the variations of current representing the telephone, telegraph or signaling message. The different carrier frequencies which are superimposed on a circuit must differ sufficiently in frequency so that they may be separated from each other at the terminals by the use of proper electrical circuits. Each carrier may be of either audible or ultra-audible frequency, but its frequency must be higher than the highest frequency represented in the message to which it corresponds. These currents are known as carriers, since in a sense, they may be said to "carry" the telephone, telegraph or signaling currents by which they are controlled.

The underlying principles of such systems are old in the communication art and indeed go back to the date of the invention of the telephone itself, for it will be recalled that it was Bell's experiments with the vibrating reed type of multiplex telegraph system which led to his discovery of the telephone.

In looking back over the early history of the carrier art it is now clear that the development of successful multiplex carrier systems had necessarily to await not only the evolution of the fundamental ideas for carrier operation, but also the development of radically new types of apparatus and the developments in electrical wave transmission over wires which have characterized the recent progress of long-distance telephony.

The telephone and telegraph systems which are described are in daily use over long toll circuits in the Bell telephone system. The telephone installations in service furnish simultaneously as many as four two-way telephone conversations over each circuit in addition to the telephone and telegraph facilities normally afforded by the circuit. The telegraph systems in service are arranged to furnish as many as ten duplex carrier telegraph circuits over each circuit in addition to the telephone and telegraph facilities normally afforded by the circuit. These figures do not indicate the maximum numbers of facilities which it will be found economical to employ ultimately, but cover the facilities furnished by the systems which are now commercially employed.

The increased circuit facilities obtained in this way are, in general, up to the high standards set for the best grade of long-distance circuits. They are relatively stable and are maintained by the regular telephone plant personnel. The carrier circuits, both telephone and telegraph, are so designed that as circuits they fit in completely with the more usual circuit facilities of the telephone system. They may be connected with each other and with ordinary circuits, and, in general, present much the same degree of practicability and flexibility of operation as do the more usual forms of circuits.

While the development has thus succeeded in making available to the communication art new types of circuit facilities, these facilities can only be made to meet the high standards required in a public service plant by the use of correspondingly high grade equipment, which, unfortunately, is correspondingly expensive. Indeed, the cost of these systems, at least at present, is such as to make their use economical only over relatively long toll circuits. For short distance toll service, and for local exchange service, the equivalent facilities can be provided more cheaply by the older methods.

As indicated, the multiplex carrier art had its origin in the harmonic telegraph systems dating back to the time of the invention of the telephone itself. With such alternating current telegraph systems are associated the names of Gray, Bell, Van Rysselberghe, Edison and Mercadier.

It will be seen, therefore, that the foundation of the carrier art was laid back in the 1890's, at which time there had been contributed these cardinal features:

1. Electrical selection or tuning.
2. The use of continuously generated high frequency carrier currents.
3. Modulation of the carrier, as by a microphone transmitter.
4. Detection and indication of the high frequency currents by means responsive continuously and proportionally to the received current.

Relations of Radio Developments

With the entrance of wireless telegraphy into the communication field, the attention of those scien-

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tists and engineers who might otherwise have developed the art of wire multiplex, so well begun, seems to have been diverted to the new found art. The wireless art started with the use of very high frequencies, generated discontinuously by the spark method, and gradually came to use waves of lower and lower frequency, and of increasing persistency. Finally, with the use of continuously generated waves, the radio frequency range came to overlap the frequency range earlier employed in high frequency wire transmission. The wire carrier art started with the use of audible frequencies and extended into the ultra-audible range, where it was later met by the radio frequencies. The similarity of the history of the two developments is illustrated by the fact that the major steps, which are noted for the early carrier art, also mark the major steps of advancement of the radio art. By reading over the four points, keeping radio in mind, the parallel will be seen to be quite complete.

These ideas of continuous wave telephone transmission were quite thoroughly appreciated in the radio art by about 1905, although they have not been fully attained in practice until quite recently. It was natural that radio engineers should carry these ideas over to wires, using radio instrumentalities which, while different in form, operated on the same principles as did the means employed by the earlier wire pioneers.

Simultaneously with this evolution of the radio art, attention continued to be given to the older wire carrier transmission by such other investigators as Vreeland in America and Bela Gati and Maior in Europe. About 1906 Vreeland, using his well-known mercury-vapor oscillator as a generator of sinusoidal carrier currents, devised a multiplex carrier telegraph system which embodied improvements in the use of loosely coupled tuned circuits in proper relation to the impedance of the line. An engineering and commercial development of this period, as distinguished from more purely laboratory or theoretical investigations, was the so-called "Phantoplex" system devised by engineers of the Postal Telegraph Company and quite extensively employed by that company. In this system a relatively low-frequency carrier telegraph channel was superimposed on the ordinary direct current circuit. In addition, attention may be called to the disclosures by Ehret and Kitsee. Ehret shows a multiplex carrier telephone system including amplifiers, and Kitsee shows a carrier telegraph channel operating over an ordinary telephone circuit.

Previous to 1910, Dr. Ruhmer in Europe had undertaken experiments on high frequency wire transmission, employing apparatus taken from the then current radio art. He employed oscillating arcs as high frequency generators, microphone transmitters as modulators, tuning at both the transmitting and receiving ends, and a radio detector in the receiving circuit.

(To be continued)

Radio Phenomena

When radio agencies were first used for long-distance communication it was noticed that signals were not transmitted as far during the day as during the night time. It has also been observed that night signals using the shorter radio waves vary greatly in intensity from minute to minute. More recently, since radio direction finders have come into use, it has been learned that great variations may occur in the direction of radio waves as they arrive at the receiving station during the transmission of signals from a given transmitting station. These and related phenomena have been recorded from time to time, and various hypotheses have been brought forward in explanation. The phenomena are dependent upon a large number of variable quantities, such as weather conditions, the nature of the country over which transmission occurs, the surroundings of the transmitting and receiving stations, and the method of handling the receiving apparatus. Only by a statistical study in which the results obtained simultaneously at a large number of receiving stations are collected and tabulated may reliable averages be obtained.

Such a co-operative study is being carried on by the American Radio Relay League and the Bureau of Standards, tests having been conducted during June and October, 1920, and January, 1921. A further series of tests will be carried out in April. In these tests from five to ten radio stations transmit signals in succession, these signals being received simultaneously at about one hundred receiving stations, whose operators are provided with forms for recording the variation in the intensity of the signals as received.

A paper presented before the Philosophical Society at Washington January 29th described the results of the tests so far conducted and proposed an explanation of the phenomena. This explanation associates the long-distance radio transmission accomplished at night with the boundary of the highly conducting outer portion of the atmosphere, which is also the origin of auroral disturbances. Fluctuations in intensity are probably caused by irregular absorption of the waves by masses of slightly ionized air through which the waves travel in their course. The fading phenomena are closely associated with the strays or atmospheric disturbances which affect all radio communication.

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Amateur Radio League Opposes Regulation Bill

The Poindexter bill for the regulation of radio communication, now pending in Congress, came under fire at the Second Annual Convention of the Third Amateur Radio District, held at Philadelphia, on February 6th, under the auspices of the Amateur Radio Relay League. The league is a national organization, composed of amateurs with high powered stations, for the purpose of relaying throughout the country personal and complimentary radiograms.

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Some Phases of Railroad Telegraph and Telephone Engineering

By STANLEY RHOADS, Telegraph and Telephone Engineer, New York Central Lines, New York.

(*This paper was read before the Ninth Midwinter Convention of the American Institute of Electrical Engineers, held at New York, on February 17th, and is printed herewith in part.*—EDITOR.)

The railroad telegraph and telephone department entered a new era when telephone train despatching was adopted thirteen years ago. In the last five years electrical engineers have been employed in this department in increasing numbers, and the development has become more rapid. Previously the telegraph and telephone departments of the railroads were content to depend on outside interests for ideas, equipment, methods of operation and development, and as a result the development was slow. The staff of one railroad telegraph department, with engineers continuously employed, has procured considerable advancement in the railroad telegraph and telephone plant in a space of four years, perhaps as much as was accomplished by all railroad telegraph and telephone departments in the four years previous to the period mentioned. This is attributed to the intensive application of electrical engineers to practical problems and obvious requirements of railroad service.

A difficulty confronting the engineer in the investigation of a problem, is to learn the state of the art in relation to the particular problem in hand. It is somewhat with the idea of presenting some data on the state of the art, as applied to railroad telegraph and telephone systems, that data and results of investigations are given here. It is hoped that any incomplete investigations can be continued by the engineers of the New York Central Lines and others; that any false conclusions can be pointed out, and that the data here presented may suggest investigations along other similar lines and on related problems.

In order to interest others than railroad engineers in these problems, it can be said that the railroad telegraph and telephone engineer, particularly of the larger railroads, has problems of a variety that includes a little of about everything confronting the plant and traffic engineers of the large telephone and telegraph companies that have nation-wide service. The extent and distribution of the plant are the chief differences. This variety gives absorbing interest to the work. As the staff of the telegraph department is small, its engineers are obliged to handle any problem that arises as best they can.

The plant under the supervision of the New York Central Lines Telegraph Department comprises 6 per cent. of the total Western Union pole line and 12 per cent. of the wire, and includes 12,000 miles of pole line with 80,000 miles of copper wire, of which 40,000 are used by the railroad; 76,000 miles of iron wire, of which 25,000 are used by the railroad on 12,000 miles of rail line. This includes a New York-Chicago long-distance telephone line, which has telephone repeaters, composite equipment, phantom circuits, and loaded cable. Practically all other important points from New York and Boston, to St. Louis and Chicago are connected in the network of service. Vacuum-tube telephone repeaters are installed at Albany, Syracuse, Cleveland, Toledo and Elkhart, with one or two additional stations soon to be installed. These lines connect railroad telephone exchanges in some cases larger than required to serve the public in small cities. The total number of long distance calls handled is about 5,000 per day. New York and Chicago have 12 position boards, and others are in proportion to the amount of business done. The New York Central Lines have about 5,500 telephones on P. B. X. boards and 4,000 direct exchange lines. The number of local calls is enormous, but is not kept count of ordinarily. City calls are counted by the telephone companies in order to make the billing where this is on measured rates. These boards are operated by the railroad, but furnished and generally maintained by the Bell telephone companies. The railroad offices in large cities have numerous one-position sub-boards in various departments.

The railroad telegraph service with its network of 40,000 miles of copper and 25,000 miles of iron wire in its own service, reaches 3,700 offices. The centers of operation at headquarters of the general staff of the railroads have large offices called general telegraph offices. The division headquarters telegraph offices are called relay offices. Such an office is at Mattoon, Ill. This office serves two telephone dispatching circuits, four telephone message circuits, two phantoms, four yard lines, two Western Union way Morse wires, four railroad single-line Morse wires, two of which are connected through repeaters, three duplex Morse wires, two of which are connected through repeaters. New York has a force of 20 telegraph operators, Indianapolis 18, Detroit 16, Chicago 14, Cleveland 13, and other cities in proportion.

The telegraph service is more extensive than the telephone long-distance system, because it must reach every station and office on the system; whereas, the telephone long-distance service is limited to the officers and employees who have Bell telephones that connect to the railroad telephone exchanges, and the way stations in general do not have access to the long-distance lines.

Direct through service is maintained between the important centers and in nearly every case between adjacent division terminals. For example, New York has a direct Cincinnati wire, also one each to Chicago, Detroit, Cleveland, Buffalo, Rochester, Syracuse, Watertown, Corning, Albany and Boston. Single Morse has the greater total mileage, duplex Morse next, but only a small amount of quadruplex is used because of its limitations.

The thirty New York Central Lines relay telegraph offices handle about 55,000 railroad telegraph messages per day. No attempt is made to count the messages handled by one way station with another,

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unless they are relayed or sent or received by the general or relay telegraph offices. The way-station operators receive and transmit Western Union commercial messages in addition to the railroad messages.

Some printing telegraph service is employed between relay offices. At present, this is limited to New York to Albany and Cleveland to Toledo. The operation is duplex, single channel, Morkrum type in both cases. In the hand operation, single, duplex and quadruplex service is employed.

The telephone is used almost exclusively for train dispatching on the New York Central Lines, consisting of 108 circuits, with 3,020 selectors on 10,271 miles of railroad. It is also being extended for way-station message service on dispatching divisions, but is at present in use on 48 circuits with 1,464 selectors, less than half the total New York Central Lines mileage. When business returns to normal it is expected that this service will rapidly extend until the railroad is on a complete telephone basis. Several different types of selectors and telephones are in use for these dispatching and message circuits.

Two railroad automatic telephone systems are in service, one at Detroit and one at New York in the electric division, neither of which is connected to the Bell telephone system. The New York installation comprises five interconnected exchanges, with 600 stations. The system centers in the Grand Central Terminal but has exchanges connected by trunks at West 72nd Street, Mott Haven, Harmon, and White Plains. The latter two are each about thirty miles from New York. An immense volume of traffic is handled on this system. The Grand Central Terminal board handles about 2,000 local calls per day, 500 incoming trunk calls, and 700 outgoing to and through Mott Haven. The high hourly load is between 3 and 4 P. M., during which period about 600 local calls are handled daily.

The privately owned telephone cable plant is gradually extending. It now extends nearly twenty miles out of New York on both the Hudson and Harlem Divisions, and will extend eventually thirty miles on each. In other cities the private cable plant is growing in proportion. In the New York territory loud-speaking telephones are used for train dispatching, also for train announcing between interlocking towers in the vicinity of Grand Central Terminal. "A" tower on the upper level of Grand Central Terminal has in use almost all practicable methods of wire communication, including Bell and automatic telephones, telautograph, loud-speaking telephone circuits, lamp signal annunciators, bell annunciators, private line telephones, and selector telephone train dispatching and messages lines. Private line telephone connection is provided between ticket sellers at the stations in the larger cities and the Pullman reservation departments in the same cities, over which reservations are handled. The telephone system is specially designed for this service. Some lines are provided from the reservation desk to the regular telephone switchboard. Special boards or tables are provided for passenger train information at the larger terminals, connecting with the regular telephone switchboard, as well as direct to the Bell city exchange.

The construction and maintenance of the pole lines, except some private line and cable, is under the supervision of the telegraph department in accordance with the contract with the Western Union Telegraph Company, and under the specifications of the latter after approval by the railroad. The installation and maintenance of the inside telephone plant is under the supervision of the telegraph department and is performed under the railroad's own plans and specifications. The telephone companies install and maintain the rented telephones and switchboards. The inside telegraph plant is installed and maintained by the railroad chiefly under Western Union Telegraph Company specifications under the contract between the two companies.

The pole line is the backbone of the telegraph and telephone plant. Railroad pole line construction in the past has been very largely based on the average-strength plan, which for a given load of wires provides that the class of poles shall be the same regardless of the extent of the exposure to ice and wind. No estimate is available to indicate how much of the average-strength type of line is too weak, too strong, or just strong enough. Lines that are stronger than necessary have cost the railroads more than was warranted for their construction, while those that are too weak will require large expenditures for maintenance, particularly after severe storms when stretches may be laid flat. Additional losses result from service interruption. Such interruptions not only consist of the loss of wire service, with the consequent train delays, but may result in a blockade when poles fall across main tracks, as has happened frequently.

In order to reduce the pole line damage and traffic interruptions to a minimum, railroad telegraph and telephone engineers have worked out an exact strength of line with an allowable factor of safety based on wind and ice data for the localities in which the lines are located or are to be built for use in construction and reconstruction work. Wind and ice data may be determined readily in any locality so that railroads can construct lines on an exact strength of line basis with a proper factor of safety which should result in economy.

The reconstruction of pole lines along the New York Central Railroad is now being handled on this basis. The desirable line consists of a cable and not more than two arms of open wires.

The type of telephone and telegraph installation now approved for way offices includes a metal box unit containing electrical protection, cross connections and terminal blocks; metal box units with porcelain panels and very substantial jacks, for patching and testing circuits; factory made cables; caustic soda primary battery common to transmitter and selector bells; and conveniently located table apparatus.

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The wire testing is performed by an organization of railroad wire chiefs, each testing office having about one operating division to supervise, which is, roughly, one hundred and fifty miles of railroad. Many of these points have three "tricks"—that is, a wire chief is on duty at all times. Others have but two men per day, and some have but one. Wheatstone bridge testing methods are used; also the voltmeter and milliammeter. The station linemen maintain both pole lines and station equipment on most of the New York Central Lines.

Problems arising from the construction, maintenance and operation of the railroad telegraph and telephone plant include electrical protection, inductive interference, electrolysis and telephone and telegraph transmission and traffic. Investigations and experimental work are continually necessary in various phases of the engineering. The oscillograph of the Electrical Engineering School of Purdue University has been available for about five years in these investigations, the major part of which has been made on actual working lines.

TELEGRAPH officials are constantly meeting at central points to talk over methods and means of improving the service and creating new business. The telegraph business does feel the effect of commercial depressions for the reason that when indications point to dullness, propaganda is resorted to to stimulate the telegraph service. Some officials doubt the wisdom of these frequent meetings. The best evidence, however, that they are fruitful in results is found in the fact that the receipts of one of the telegraph companies have increased from thirty million dollars per year to over one hundred million dollars per year during the past ten years.

Questions of Mandates and Cables Interwoven

Final disposition of the former German cables seized by Great Britain, France and Japan during the World War have become interwoven, it developed, with the larger question of the status of the various mandates assumed by or proposed to be granted to the allied powers.

One of the parties to the negotiations between the allied and associated governments concerning the cables said that the Japanese government probably would not have offered serious objection to the American proposal to make the island of Yap available for cable and communication uses to all nations on an equal footing if it had been understood that such a decision would not affect the validity of the Japanese claim to an exclusive mandate over this former German island.

It was learned that the International Communications Conference in Washington had been considering the possibility of compromising the positions of the various parties to the conference by separating the cable question from that concerning mandates. There will be further discussion of this subject when the conference resumes its sessions.

It is understood that the British delegate to the conference is still without final instruction from his government. It was the absence of these instructions which caused a postponement of the sessions.

An interesting game of hockey took place at the Montreal Arena on February 20th between a team composed of Canadian Pacific Railway commercial telegraph messengers from the Quebec city office versus a similar aggregation recruited from the ranks of the Montreal office.

The game was closely contested from start to finish, and at full time the score stood 2 to 2, necessitating overtime play. The deciding goal fell to the Montreal representatives, Alexander doing the trick after a very clever exhibition of stick handling.

The brand of hockey exhibited throughout was uniformly good. For the visitors O'Farrell and Cane were particularly effective, while Alexander and Legault starred for the Montreal team.

Referees Joe Roddick and Mike McMahon had the game well in hand at all times and deserve credit for their impartial rulings, which gave general satisfaction.

Superintendent of Telegraphs W. M. Thompson faced the puck and was an interested spectator throughout the game. A surprisingly large gallery turned out to encourage the local team. The visitors took their defeat like true sportsmen, and a return match has been arranged, which will take place in Quebec later in the month.

Books Covering Printing Telegraph Systems

To meet the growing demand of those desiring books covering printing telegraph systems we strongly recommend the following works, which give a wide range of study on all of the printing systems in use to date:

Crotch, Arthur.—Hughes and Baudot Telegraphs; 83 pages; 41 illustrations. This is a practical description of these two systems of telegraphy which are in extensive use in England and on the Continent; devoid of mathematics and technicalities; a timely book for American student telegraphers; $1.25.

Finn, Wm.—The Barclay Printing Telegraph System; paper cover. This work describes in detail the Barclay Printing Telegraph System; 50 cents.

Pendry, H. W.—Baudot Printing Telegraph System; 144 pages; 60 illustrations. This is a very complete description of this important system of telegraphy and is written in a clear manner; well adapted for self-instruction; devoid of mathematics; treated practically and not technically; $1.40.

The Morkrum Printing Telegraph System was illustrated and described in all its details in TELEGRAPH AND TELEPHONE AGE, dated November 16, December 1 and 16, 1919, January 1, January 16, February 1, and February 16, 1920. Price of these seven issues, $1.50. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, John B. Taltavall, Publisher, 253 Broadway, New York.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

J. J. GHEGAN, president of the J. H. Bunnell and Company, Inc., New York, sailed for Porto Rico on February 19th. He will return to his office about the tenth of March.

J. FRANK HOWELL, the well-known old-time telegrapher, for the past twenty-five years a well-known stockbroker in New York, is making a trip to Central American countries. He was in Venezuela last week.

W. R. HOLLIGAN, at one time chief operator of the Western Union Telegraph Company, Chicago, but for the past twenty years identified with Wall Street, New York, is seriously ill at this home in this city.

POSTAL TELEGRAPH-CABLE COMPANY

United States Sues Postal for Accounting

A suit in equity by the Federal Government against Clarence H. Mackay and the ten other trustees of the Mackay Companies, operating the Postal Telegraph system, was filed on February 21st in the United States District Court by Assistant United States Attorney Earl B. Barnes. The Government asks for an accounting by the trustees of moneys received by the Postal Company for telegraph services while the company was under Federal control during the war.

About $2,000,000 is said to be involved in the suit, representing the amount which the company received in addition to the rental paid by the Government, but which the Government alleges the company has not accounted for.

THE company has moved into its new business office at Cleveland, Ohio, where an entire building has been rented by the company and fitted up with the most modern and efficient equipment. The installation of the office was under the immediate direction of W. L. Simpson, division engineer, Chicago. In addition to the improvement in methods and equipment for handling telegraph traffic, a modern central energy switchboard has been installed in order to properly take care of the company's growing long-distance telephone service at this point.

J. F. SKIRROW, chief engineer, is in Florida making an inspection of the new extension and of the equipment of offices recently opened on the Florida East Coast.

E. P. TULLY, assistant to the general manager, is visiting various offices in New England, paying special attention to the development of local service.

MRS. JOSEPHINE SCHOPP, aged seventy-seven years, mother-in-law of Secretary W. B. Dunn, died at the residence of the latter on February 18th. She had been seriously ill for some time. Mr. and Mrs. Dunn have the sympathy of the entire force.

F. F. NORTON, of New York, is visiting several of the larger operating departments in the western division.

THE branch office at 96 Essex Street, Boston, Mass., has recently been remodeled and renovated in order to take care of the large increase in business at that point. A new front has been installed which adds to the appearance of the office.

Managers Appointed

R. H. Mills, Huntington, W. Va.; F. P. Scott, Fostoria, Ohio; Miss M. Ford, Seaford, Del.; Mrs. Mary Henderson, Alton, Ill.; A. C. Horton, Alliance, Ohio; L. C. Bevan, Hendersonville, N. C.; E. J. Ferree, Burlington, N. C.; Melba M. Baker, Kings Mountain, N. C.; J. B. Duncan, Aiken, S. C.; E. H. Perry, Gastonia, N. C.; C. F. Metzner, Port Huron, Mich.; Richard A. Hynes, Stamford, Conn.; J. H. Alexander, Piqua, Ohio; E. V. Eckhart, Ashland, Ohio; E. J. Baker, Red Bluff, Cal.; A. J. Daniel, Toccoa, Ga.; J. H. Caldwell, Cartersville, Ga.; M. Zeman, New Bedford, Mass.; R. D. Wyman, Lowell, Mass.; Miss Selma Ashcraft, Michigan City, Ind.; D. R. McKeehan, Bucyrus, Ohio; W. J. Blair, Laurinburg, N. C.; E. L. Martin, Montgomery, Ala.; A. W. Harris, Duluth, Minn.; Georgia P. Gartin, Council Bluffs, Ia.; Nettie McCara, Newton, Ia.; Sena Frandle, Beloit, Wis.; C. Patnoid, Leominster, Mass.; C. B. Schooley, Herkimer, N. Y.; M. H. Goldstein, Hudson, N. Y.; I. Cooper, Suffern, N. Y.; W. E. Page, Berkeley, Calif.; G. W. Barrett, Orange, N. J., and Mrs. Huber, Norwalk, Conn.

New York Operating Department

E. GUTHERBELET, who works the first Philadelphia bonus, is the proud father of a son.

W. F. STERLING, one of the old guards of the office, is back from his vacation.

W. C. MICHINER, assistant chief operator, is recuperating after undergoing an opertion for appendicitis.

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THE boys from the operating department are forming a baseball team, and it will be known as "The Postal." Training will start in March, and all branch offices are challenged, especially the Stock and Cotton Exchange offices. Address all communications to R. E. Walsh, manager.

WESTERN UNION TELEGRAPH CO.

NEWCOMB CARLTON, president, has been chosen as a member of the Board of Directors of the newly organized International Acceptance Bank now being established to finance America's foreign trade.

PRESIDENT NEWCOMB CARLTON and Vice-Presidents J. C. Willever, W. N. Fashbaugh, G. M. Yorke and Assistant to the President L. McKisick, and W. C. Merley, secretary to the party, have returned to their respective offices after a southwestern and southern trip, which kept them from the city about three weeks. The party went as far south as Miami, Fla., southwest to Dallas, and west to Detroit.

HARRY M. WEIDLER, whose appointment as superintendent was recorded in the previous issue, to succeed A. Simon, who resigned to enter other business, will preside over the third district, Metropolitan division, New York. The third district comprises Western Union offices located in that portion of New York City from 42nd Street north to the city line and river to river.

C. F. AMES, district commercial superintendent, Boston, was an executive office visitor on February 25th.

New York Western Union

S. B. HAIG, division traffic superintendent, has returned to his office after trips of inspection to Boston, Buffalo and Pittsburgh.

FARREL J. SHERIDAN, who has been confined to his home by illness for several weeks, is expected to return to the office shortly.

R. H. TUCKER, who recently made a trip to Chicago, has returned and has assumed the duties of general traffic chief.

O. W. HELLBERG, chief operator of the Worcester, Mass., office, has resigned to engage in other business.

CHARLES J. MULLER, who was identified with the marine department in this office for the past twenty-five years, and who acted as chief operator since 1913, died on February 15th. Mr. Muller was a veteran of the Spanish-American War and did service for the government during the recent World War. The remains were buried with military honors, a detachment of soldiers from the receiving ship *Bay Ridge*, under the command of Chief Petty Officer J. L. Sutherland, firing three volleys over the grave. The honorary pallbearers were Oscar G. Zilly, J. Doughty, G. E. Murphy and J. V. Riddick.

GEORGE MARCYES, aged sixty-seven years, a member of the operating force for over twenty-five years, died on February 17th. He was stricken at his desk and died a little later in the office hospital.

Eastern Division

A. WOODLE has been appointed city superintendent, Pittsburgh.

C. B. HORTON, superintendent, New York, has been appointed city superintendent, Buffalo, N. Y.

F. R. VEALE has been appointed district commercial superintendent, third district, with headquarters at New York.

F. L. KELLOGG, for several years connected with the general manager's office, New York, died on February 19th, after an illness of several months.

J. P. STEVENSON, of Yonkers, N. Y., has been transferred to New Rochelle, N. Y., as manager, vice M. M. Levitt, resigned.

PETER VANDERVLIET, of Mount Vernon, N. Y., has been appointed manager at Yonkers, N. Y.

Lake Division

B. C. NELMS, manager, Springfield, Illinois, was married on February 17th.

MISS AGNES MILLER, automatic operator in the Rockford, Illinois, office for the past two years, was married to Sergeant H. R. Roberts of Camp Grant February 5th. She spent her honeymoon visiting Chicago and Minneapolis, returning to the office at Rockford at the end of that time to resume her position with this company.

WITH the gallantry characteristic of their sex, the forty men members of General Manager's Local No. 36, of Chicago, sacrificed their own ambitions and helped to elect the following members as officers for the current year: Miss M. Swink, president, and Mrs. Amy Taylor, secretary-treasurer. This is the only exclusively general manager's local, Association Western Union Employees, in the organization, and despite its slight strength numerically—less than sixty members—the interest in the meetings and in the activities of the local has been most enthusiastic. On February 10th the entertainment committee under the direction of Misses Leaf and Wilde and Mr. Heim arranged a delightful Valentine dinner, with President Hayes, Secretary-Treasurer Hayes, Vice-President Wach and C. M. McCann as guests of honor. M. H. Strider acted as toastmaster and introduced the speakers in his usual happy manner. Those having part in the entertaining program, besides the guests of honor, were Misses Amster, Poggendorf, Lewis, Talty and Moller, and Messrs. Harding, Mason, Kline and Glaser. A message of regret was read from

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General Manager A. C. Cronkhite, whose absence from the city prevented his acceptance of the committee's invitation to be present as one of the local's guests.

CINCINNATI LOCAL 51, Association of Western Union Employees, celebrated the event of the season on the evening of February 5th, when they packed the Odeon to see the vaudeville performance put on by some of its members. There were twenty performers in the casts and all acquitted themselves very well. Their names follow: Edward Hardaway, Charles Keyes, Geo. W. Keith, Jr., T. Frank Heston, Walter G. Daugherty, Fred Nuxoll, Stephen Ison, Bernard R. Hayes, Anthony Schiele, Margaret Downey, Daniel Loeb, Anna Weichmann, Ross Sater, Elizabeth Weichmann, Robert Ash, Harry Nides, Katherine Cooke, Mildred Wolf, Margaret Gilb, Si Constantine and Blanche Herty. The feature of the evening was an act entitled "If I owned the Western Union," in which a telegraph office was more or less faithfully reproduced. The show was under the management of Lester M. Jacobs, and was directed and written by Geo. W. Keith, Jr.

W. W. HOSKINS, who recently resigned the chief operatorship at Houston, Texas, has been appointed chief operator of the Miami, Florida, office.

L. I. FLOWERS has been appointed chief operator of the Houston office, vice W. W. Hoskins.

Radio Corporation of America

PRESIDENT E. J. NALLY sailed for home on the steamer *Imperator* on February 26th.

CHIEF ENGINEER E. F. W. ALEXANDERSON is in Sweden.

ROY A. WEAGANT, consulting engineer, is rusticating in Nassau, B. W. I., with his family.

COMMERCIAL MANAGER DAVID SARNOFF has returned from Washington.

TRAFFIC MANAGER W. A. WINTERBOTTOM is inspecting the Pacific Coast stations.

All America Cables

JOHN L. MERRILL, president of the company, who left New York on January 21st, for a trip to Galveston, New Orleans and the Isthmus of Panama, returned to the city on February 24th. Mr. Merrill was accompanied by Mrs. Merrill and his private secretary.

THIS company has been granted a concession by the Mexican government to lay a cable between Galveston, Texas and Tampico, Mexico.

IT IS contemplated to erect another building adjoining the 89 Broad Street headquarters of the company in New York, to take care of the increasing needs of the company.

A Valuable Book For Students

"The Thermionic Vacuum Tube." By H. J. van der Bijl. New York. Cloth, 391 pp. (9 ins. by 6 ins.) with 232 illustrations.

In this work the author has endeavored to present the principles of operation of thermionic vacuum tubes, and to co-ordinate the phenomena encountered in a study of this field. Such a procedure results in a more valuable book than simply a detailed description without proper co-ordination of the many investigations that have been published on this subject. The treatment is sufficiently elementary to meet the demands made on a book of this kind. This is especially the case with the first few chapters, which must be regarded as very elementary and mainly intended for those who are interested in the applications of thermionic tubes, but are not sufficiently acquainted with the properties and behavior of electrons to understand the operation of these tubes.

The book is divided into ten chapters, the first three chapters dealing with the properties of electrons and their dislodgment from vapors, gases and solids. The next two chapters deal with the physics of the thermionic valve, and the influence of gas on the discharge. Rectification of currents, amplifications, oscillation generation, modulation and detection of current and miscellaneous applications are covered in the last five chapters. This book is well prepared and gives a good presentation of the present developments of the thermionic vacuum tube. It would make a valuable addition to any library. Price, $5.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Every Telegrapher Should Have a Knowledge of Phillips' Code

Phillips' Code (*New Edition*). A thoroughly tested code of abbreviations arranged for telegraphic purposes and contemplating the rapid transmission of press reports; also widely used as an easily acquired method of shorthand. Revised and brought up to date, with supplement to February, 1920, by E. E. Bruckner, one of the most expert press code telegraphers in the country. The new edition contains about 700 additions to the older code, and is indispensable to the telegrapher who would become a *finished* telegrapher. Mr. Milton Garges, Chief of the Traffic Dept., Associated Press, New York City, in a recent announcement, following the abandonment of experimental operation of printer service between New York and Washington, said: "One way telegraphers can help themselves is by helping to develop Morse men." The standard of proficiency required by press associations includes a knowledge of Phillips' Code. Flexible cover, vest pocket size, $1.25 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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Obituary.

S. F. COLTON, aged sixty-seven years, superintendent of telegraph of the Rutland Railroad Company, Rutland, Vt., died at that place on February 22nd.

CHARLES B. SCHOENMEHL, aged sixty-two years, president and treasurer of the Waterbury Battery Company, Waterbury, Conn., and New York, died on February 14th. He was well known to the electrical profession as an inventor.

MRS. CLARA TAYLOR HOTCHKISS, wife of Horace L. Hotchkiss, a retired member of the New York Stock Exchange, died on February 24th at the Hotel Webster, New York, where she had been stopping for the winter. Her home was at Rye, N. Y. Mr. Hotchkiss is well known to the telegraph fraternity and he has the sympathy of his telegraph friends.

MILTON H. SMITH, aged eighty-five years, president of the Louisville and Nashville Railroad Company, died at Louisville, Ky., on February 22nd. Mr. Smith was an old time telegrapher and was an operator in the Confederate service during the Civil War. He was a native of New York State and was one of the foremost railroad magnates in the country.

Death of L. W. Wortsman

L. W. Wortsman, aged seventy-eight years, an old time telegrapher and a member of the United States Military Telegraph Corps during the Civil War, of Savannah, Ga., for many years past, died at Dallas, Texas, on February 16th. Mr. Wortsman entered the telegraph service in 1861 and became identified with the United States Military Telegraph service in 1864 at Hilton Head, S. C., under Captain L. F. Sheldon. He was later made chief operator of the northern district of the Department of the South under Captain James R. Gilmore. Mr. Wortsman was at Fort Wagner, S. C., during the bombardment of Charleston, and he had to work in a bombproof office.

On the evacuation of Charleston by the Confederates, Mr. Wortsman and Captain Bennett, history records, were the first to enter that city. Mr. Wortsman later reconstructed the telegraph lines in South Carolina for the government.

After the close of the Civil War, Mr. Wortsman went to Europe, and saw some of the Franco-Prussian War. Returning to the United States in 1871, he became superintendent of construction of the Southern and Atlantic Telegraph Company and manager of many of its principal offices. In 1878 Mr. Wortsman left the telegraph service, locating in Savannah, Ga., where he had resided ever since, and was engaged in outside business.

Mr. Wortsman and his wife were visiting his brother at Dallas, Texas, when he was stricken with acute Bright's disease. He was a thirty-second degree Mason, and the remains were buried with Masonic honors at Savannah, Ga.

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The Late Frank A. Pickernell

In the death of Frank A. Pickernell on February 12th, as recorded in our February 16th issue, on page 96, the electrical engineering profession of the United States loses one of its most valuable members. Mr. Pickernell was for many years engineer of the American Telephone and Telegraph Company, with headquarters in New York.

He was born in Boston in 1865, and in 1895 was graduated as an electrical engineer from the Massachusetts School of Technology. After a year as instructor at the school, he entered the service of the American Telephone and Telegraph Company and remained in that work until he retired about two years ago.

Mr. Pickernell was active in the company's construction work at the time the first long-distance line was opened between New York and Chicago, and later became assistant to the president, Frederick T. Fich. He was one of the first members of the American Institute of Electrical Engineers, holding the fifth emblem of the society given members at the time of organization. He was also a member of the Telephone Pioneers of America.

Mr. Pickernell was in San Francisco during the earthquake and fire, having just completed a reorganization of the San Francisco telephone system the day before the disaster. He remained in that city to reconstruct the lines again.

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Jones' Book of Diagrams

The text-book of the telegraph profession, "Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, is by far the most popular electrical book on the market. This standard work has been carefully revised and brought up to date, and includes full descriptions of the newest apparatus adopted by the Western Union and the Postal Telegraph Companies. It presents the finest study of the telegraph ever published; it explains clearly the equipment of a modern telegraph office, and is a text-book that no student, operator, engineer, or official can afford to be without; 64 chapters, 488 pages, 250 illustrations. A new edition issued in April, 1918, includes an appendix of 24 pages, containing 16 illustrations, covering the new Western Union Multiplex System. Price $2.50 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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ALFRED MORALES, manager, French Cable Company, at San Juan, Porto Rico, after a three months' vacation spent in the United States and Europe, is again on duty at his accustomed post.

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APPLICATION is the price to be paid for mental acquisition. To have the harvest we must sow the seed.

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CONTENTS

Recent Attainments in Wired Radio. By R. D. Duncan, Jr. (Continued from page 101, March 1st issue) 122

A New Form of Swindling 124

Carrier Current Telephony and Telegraphy. By E. H. Colpitts and O. B. Blackwell (Continued from March 1st Issue, page 113) 125

Plain Tales of the Telegraph Line. By Robert Ellis 126

The Telephone Cable Connecting Key West and Havana 127

Wireless Waves. By Lt. Col. C. G. Crawley, R.M.A. 128

Student's Course in Technical Telegraphy. By Louis Casper. Lesson 23 130

Confidence 132

American Telephone and Telegraph Company's Annual Report 133

Editorial—The Island of Yap. United States Tests British Claim to Wireless Monopoly in China. Aurora Borealis. The Electron Theory of Matter 134

The Railroad. The Atomic Code. Cuban Telephone Cables 137

Railway Time Service. By H. Hulatt 138

Obituary. Radio Station in Poland 139

Telegraph and Telephone Life Insurance Association. Dot and Dash Club of Philadelphia 140

Current Events. Personal. Postal 141

Western Union Telegraph Company 142

Radio Corporation of America. Canadian National Telegraphs. Old Time Telegraphers and Historical Association. Associated Press.. 144

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Recent Attainments in Wired Radio

By R. D. DUNCAN, JR.,
Radio Engineer Signal Corps, U. S. Army, in the *Journal* of the Franklin Institute.

(*Continued from page* 101, *March* 1 *issue*)

Views of the transmitting and receiving equipment of both the fixed and mobile stations are shown in Fig. 11.

In the Washington-Baltimore experiments, as well as in the later ones, evidence of the existence of standing waves on the telephone lines was obtained; this was quite noticeable in the moving-train experiments later described. Standing waves, as is well known, are produced by reflection from either the far end of the line, or from intermediate points where there occurs a sudden transition in the electrical properties such as produced by the introduction of short lengths of cable or changes in the size of conductor. In the latter case, unless the reflection is complete, a portion only of the outgoing wave will be turned back, and a portion will proceed unreflected; as a result there will occur partial reflection and partial unreflected transmission. The location of the receiving apparatus with respect to the transmitter, when standing waves are present, is, therefore, determined largely by the wave-length or frequency of the carrier wave, since for efficient reception, it is necessary to avoid both voltage and current nodes. It was found that altering the frequency at the generator terminal apparently did not produce an effect in moving the nodes and loops along the lines equivalent to that of moving the receiving apparatus.

In the preliminary experiments previously mentioned, and in the earlier New York Central tests, one overhead wire with a ground return was employed. A comparison of this arrangement with an all-metallic circuit showed that the latter was the much superior of the two, both as to volume of speech received and elimination of external disturbances such as that produced by nearby radio stations. The reason for this improvement is attributable to the pronounced energy radiating and absorbing properties possessed by the one elevated wire with ground return. Both the direct current and "skin effect" resistance of a metallic loop should be equal to approximately twice that of one wire and ground. Theory indicates, however, that the resistance introduced by radiation is proportional, among other factors, directly to the effective distance between the conductors, which in the case of an elevated wire with ground return, is equivalent to the distance between the wire and its "electrical image" in the earth or to twice its physical height above the ground. This distance, of course, is many times greater than the spacing between the two metallic conductors and hence at frequencies where the radiation plays an important part, the effective resistance of the latter system should be much less than the wire-ground system. This conclusion is borne out by the tests referred to and by actual resistance measurements which are described later on.

The question of cross-talk was investigated, as it was believed that at the high frequencies inter-line disturbances might be prohibitive of utilizing the same carrier frequency on more than one line or pair of lines on the same pole. In the Washington-Baltimore tests it was found that it was possible to receive signals with the lead wire to the receiving apparatus disconnected from the line in question and held in the immediate vicinity of the same or wrapped around, but not making contact therewith. Signals of reduced intensity were also received with the lead wire connected to other immediately adjacent lines on the same cross-arm. Complete elimination of cross-talk to other lines, however, was obtained when the first few miles of conductor adjacent to the transmitting apparatus ran through underground cable. When employing an entire metallic circuit, at the very highest frequencies used, there was a complete absence of cross-talk to the other conductor pairs on the same pole line.

The problem of multiplexing the lines was also studied, but limitations in time available for field operations did not permit of utilizing the degree of thoroughness which the successful solution of this intricate problem demands.

As a prerequisite to the solution of the main problem of multiplex there are the solutions of the two allied problems of multiple transmitter operation and duplex telephony; by duplex telephony is meant simultaneous transmission and reception, accomplished without the assistance of switching devices. The difficulties encountered in multiple transmitter operation are not serious and are easily overcome; those encountered in duplex telephony, however, if the band of frequencies available is restricted, are most serious, and become almost insurmountable if the receiver sensitivity is at all heightened by the use of radio frequency amplifiers. Utilizing artificial line loads, the design and construction of which is described elsewhere in this paper, the problem has been successfully solved in the laboratory at the present writing, only by paying the most strict attention to details of apparatus, design, construction, and shielding.

A very interesting application of wired radio is that of establishing communication with a train while in motion. The utility of such a system for insuring greater safety of travel, transmission of business information, etc., is readily realized. In 1914 and 1915 experiments were carried on by the Delaware, Lackawanna and Western Railroad with a view to establishing such a service by radio. According to reports published at that time, transmitting powers in the neighborhood of one kilowatt and antennas averaging 150 feet in height and between 200 and 400 feet in length were employed. With this arrangement, telephonic communication of a more or less satisfactory character was obtained between a moving train and a fixed station for distances up to fifty miles (80 Km.). It was reported that the directional properties of the transmitting and receiving antennas utilized in these tests were very noticeable; when the train was in movement over a section of track containing num-

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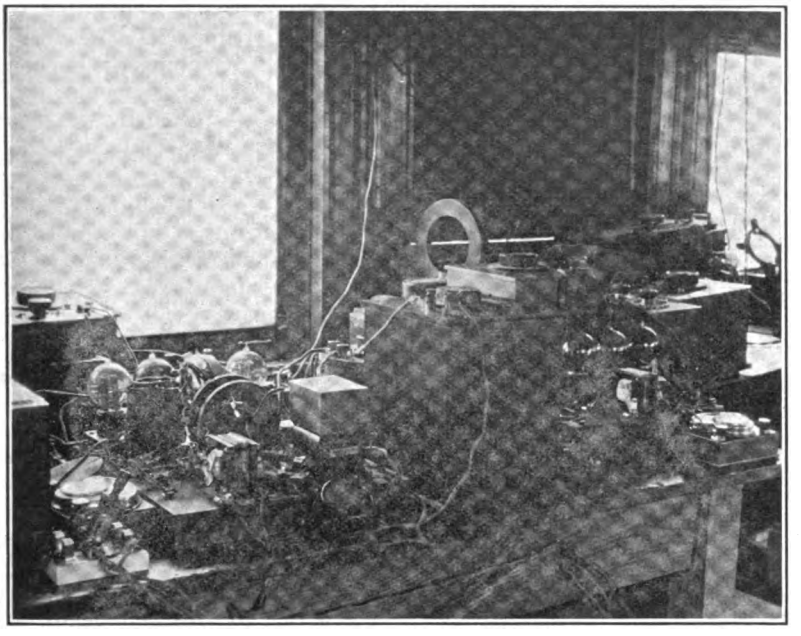
erous curves, the received signals fluctuated greatly in intensity. As adapted for this purpose, wired radio utilizes the telephone conductors paralleling the railroad tracks as a properly directed path for the carrier frequency currents. The transmitting and receiving apparatus at the fixed station was



APPARATUS IN FIELD STATION

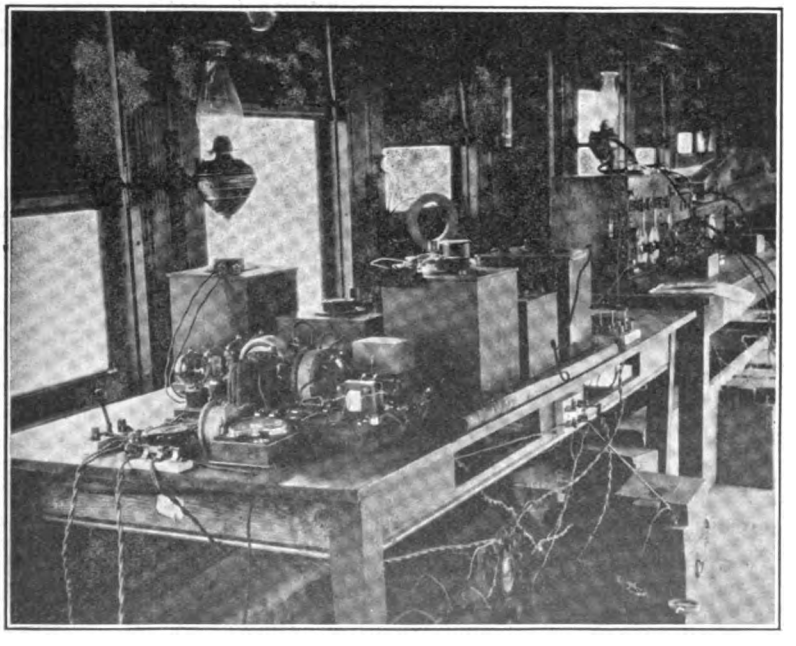


FIG. 11. APPARATUS IN MOBILE STATION

connected between one aerial wire and the ground; in the moving station the apparatus was connected to a closed loop, properly orientated with respect to the telegraph wires. The transfer of energy from the elevated wires to the loop, or *vice versa*, is effected by the inductive action of the electro-magnetic field. Employing this system and with high frequency powers in the neighborhood of 2 watts, an excellent quality and quantity of telephonic speech and telegraphic signals were obtained between the two railroad coaches, one stationary and the other in motion, over distances ranging up to ninety miles (145 Km.). During the moving-train tests, the presence of standing waves on the lines was again verified; the signals received in the moving station varied periodically in intensity as the car was under way.

A knowledge of the electrical load properties of

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the two elevated conductors or of one conductor with ground return, when operating at the extremely high frequencies, is prerequisite to the design and development of both transmitting and receiving apparatus. *A priori,* it is known that the load resistance and reactance of the lines, i. e., the effective resistance and reactance into which the radio frequency generator works, and in effect the internal resistance and reactance of the generator which furnishes power for operation of the receiving apparatus, are functions of the frequency. The exact manner of their variation with the frequency is implicitly contained in the standard theory of transmission lines, but so far as the author is aware, only a limited amount of experimental data has been published which tends to confirm the theory at the low range of high frequencies and practically none when extremely high frequencies are dealt with. With such information artificial lines may be constructed which will permit of a thorough study of the high frequency properties of transmission lines and upon which the development of transmitting and receiving apparatus may be based. The problem corresponds to the problem of measurement of the constants of a radio antenna. . . .

Measurements of the sending end reactance and resistance as functions of the frequency, of an artificial transmission line, whose receiving terminals were open, over a range of frequencies up to and including the third harmonic, have been described by Morecroft, who obtained a periodic variation in the reactance from positive to negative values, and a pulsation in the resistance values.

In a distributed system in which the physical length is very great in comparison to a wavelength, it is evident that the line load may function either as a positive or negative reactance depending upon the frequency of the impressed emf; the resistance will also vary between certain maximum and minimum values.

The theory as is generally given requires modification when considered from the standpoint of high frequencies, since it is implicitly assumed that the four line constants, viz., the unit resistance, inductance, capacity and leakage conductance are constant and independent of the frequency. This assumption is quite valid when dealing with very low frequencies, but does not hold for all of the four line constants at high frequencies. Two agencies act to make this the case, viz., the progressive unequal distribution of current over the conductor cross-section as the frequency is increased, and the finite velocity of propagation of the electromagnetic field; this velocity is taken to be equal to that of light, viz., 3×10 centimetres per second. The first of these phenomena, commonly known as "skin effect," causes the inductance of the conductor to decrease and its resistance to increase, as the frequency increases. Expressions have been derived and tables prepared which permit the rapid calculation of the change in the inductance and resistance of straight wires for frequencies from 100 to 3,000,000 cycles per second. It is of interest to note in this respect that the inductance change with the frequency is relatively slight while the change in resistance may be very great. As an illustration of the changes predicted by the theory for the case of a pair of No. 9, A. W. G. hard-drawn copper wires, spaced fifteen inches, the inductance computed for the frequencies of 25,000 and 1,000,000 cycles per second were, respectively, 3.68×10 and 3.60×10 henrys per loop mile, or a change of 2 per cent.; the corresponding values of resistance at the two frequencies are very closely equal to 16 ohms and 90 ohms or a change of over 500 per cent. So far as is known, the unit capacity of the lines is not affected by the change in current distribution with the frequency.

(*To be continued*)

A New Form of Swindling

A smooth stranger giving his name as Chester Surface fleeced the manager of a local Western Union Indiana telegraph office out of one hundred dollars a few days ago, with a game which to the knowledge of Western Union officials has never been previously tried.

The manager was interviewed by the stranger, who stated that he wanted to wire $100 to his brother, who was in Cincinnati awaiting a surgical operation, but who the doctors would not operate upon without the funds being deposited to cover the expense of the job. He represented the case as being one of life and death, and his story touched the manager.

Upon making settlement of the transfer, Surface stated that he had no cash on his person, but would give a check for the hundred dollars. To this the manager took objection, stating that it was against the rules of the company to accept checks from strangers. Again Surface told his story, and the manager accepted the check, which was written on a Brightwood bank. Surface paid cash covering the transfer charges.

The check was returned by the Brightwood bank "protested," as the man had no funds in that institution and was unknown there. The manager began an investigation in an effort to locate his man. It developed that after he had wired the money to his brother, in care of the Grand Hotel, at Cincinnati, Surface went to that place, registered as Frank Surface, the name in which the money transfer was made. The Western Union made the delivery of the check and he secured payment at the Cincinnati bank.

Binders for Telegraph and Telephone Age

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Carrier Current Telephony and Telegraphy

By E. H. COLPITTS AND O. B. BLACKWELL

(*Continued from page* 113, *March* 1*st issue*)

In 1910 and 1911 Major, now Major-General, Squier carried out a set of experiments employing a carrier channel operating over a short telephone cable circuit. The announcement of his work popularized interest in this art, and the paper which he presented before the Institute in May, 1911, brought out considerable discussion.

A high frequency alternator is employed to generate the carrier current, a microphone transmitter is used as a modulator, tuning is employed at the sending and receiving ends, and a radio detector is employed in the receiving circuit.

As a part of the evolution of the radio art, there was developed in its early and somewhat crude form a device which was destined to play an important part, not only in radio, but in wire communication as well, that is, the thermionic tube. Originally invented by Edison, this device was first applied as a radio detector by Fleming about 1904. DeForest in 1906 made a vital contribution by adding the grid, and thereby laid the foundation for its use as an amplifier.

The preceding history brings us up to about 1912. About this time an important step was taken toward the adaptation of the vacuum tube as a non-distorting amplifier by the addition of a negative grid battery by Lowenstein.

Since the above date, in addition to the active developments which were carried out in the Bell System, certain other investigators have been working in this field, among whom may be mentioned the General Electric Company, U. S. Signal Corps Engineers, Lee DeForest and certain European investigators, especially in Germany and France.

Bell System Developments: The most important developments, which have occured since 1912 and are principally the work of the Research and Development Departments of the Bell System, may be stated as follows:

1. Development of the thermionic vacuum tube into a reliable and stable instrument for amplification, modulation and demodulation.
2. Development of the electrical filter and an improved technique of separating electrical currents of different frequencies.
3. Development of the technique of transmission over wires, particularly in connection with repeater operation and in methods of overcoming interference between circuits.
4. Development and operation of commercial carrier systems.

In considering the above developments which have led to commercial operation, it should be appreciated that in order for a carrier system to be commercially successful, it must compete on equal terms with the ordinary types of wire circuits, that is, it must have the same degree of reliability and stability, and must give the same degree of privacy and the same freedom from interference. Moreover, the system must be capable of being readily maintained and must be arranged so that it may be used interchangeably in the ordinary manner with any of the facilities furnished by the plant. All of these conditions must be met at a cost less than that of the ordinary types of circuits for similar service.

Development in Thermionic Vacuum Tubes: The development of the thermionic vacuum tube as an amplifying element in a telephone repeater has already been described, as has also its application to radio telephony.

The success which attended these two lines of development indicated that in this one device was embodied the solutions of many of the controlling difficulties that had previously stood in the way of the commercial development of carrier systems In connection with a resonant circuit, the vacuum tube provides a compact and reliable source of continuous oscillations of readily adjustable frequency. As an amplifier of both low and high frequency currents, it removes the necessity for excessive line currents. As a modulator and demodulator, it provides an ideal means of impressing the voice waves on the carrier current, and of restoring them to their original form at the receiving end. These tubes have, moreover, been developed into devices which are very stable and reliable in operation, and may be maintained with only routine periodic supervision.

Electrical Filters: Another development which has been of vital importance in the success of carrier telephone systems is that of the "band filter" invented by G. A. Campbell. Without such electrical filters, it would be impossible to utilize economically the relatively low frequency range employed in the present carrier telephone systems, or to separate various channels in this range from each other or from the ordinary telephone and telegraph channels. The simple tuned circuits of the prior art would either introduce prohibitive distortion, or, if made sufficiently non-selective to avoid distortion, would require placing the carrier channels widely apart in frequency. The Campbell filter, therefore, enabled the carrier channels to be squeezed closely together at comparatively low frequencies where the difficulties of transmission over lines is at a minumum.

Transmission Over Wire Circuits: Since the attenuation over wire circuit is much greater at carrier frequencies than at the ordinary telephone frequencies, the successful operation of carrier systems is particularly dependent on the use of repeaters at comparatively frequent intervals in the line. This has required the development of high-frequency repeaters involving the application at high frequencies of all the developments of the repeater art. As in the case of telephone repeaters at voice frequencies, the amount of amplification which can be given by each repeater depends entirely on line conditions, such as the degree of line balance which can be maintained at the repeater point and the degree to which mutual interference between line circuits can be prevented.

This prevention of interference between line cir-

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cuits required the development of more elaborate methods of transposing and adjusting them. In order to overcome the large transmission losses and irregularities introduced in open-wire lines by unavoidable sections of cable, new types of loading for cable circuits were developed for these carrier frequencies and put into practical use.

(To be continued.)

PLAIN TALES OF THE TELEGRAPH LINE

How Jensen Gave the Gang a Day Off

By Robert Ellis, New York

"Manor!" shouted the lean-visaged, blue-appareled, brass-buttoned brakeman at the threshold of the rear end smoking car on the Long Island main line train No. 204, as the string of cars drew jerkily into this bit of wilderness of scrub oak and pine, stretched out near the extreme length of the island. Given a voice as to a choice of picnic grounds, this dejected vista of scenery manifested before their eyes, had no attraction for men of the type which characterized the personnel of Tim Sullivan's gang. It was an uninviting scene; the only building visible was a sand-begrimed, weather-beaten structure which served the double purpose of a waiting room and an evidence that such a place as Manor enjoyed the distinction of being recorded on the time table of the Long Island Railroad. Except for entraining and detraining a few passengers annually, trains rarely came to a full stop at this point. It was invariably a toot of derision approaching the shack, a pretense of slowing down, and the steel monster slid past the station to its journey's end at Greenport.

At the brakie's curt announcement the entire gang of an even dozen linemen, who were wearying of an irksome three-hour run, launched themselves almost simultaneously out in the narrow aisle and trooped briskly out of the smoke-laden car, Tim Sullivan, their boss, preceding them.

Languidly shuffling in the rear was the new "grunt," Jensen, the Swede. (Grunt, a ludicrous name for a Groundhand), burdened with a bulky sack brimming full of glass insulators, which he was sustaining easily without any apparent stress, as he was endowed with prodigious strength, as he himself was very well aware of. With all his shortcomings, this atoning virtue was quickly recognized by the big boss when he hired Jensen that morning at Long Island City. Sullivan was to live to regret his benevolent act a few hours later, as this narrative will reveal. As the slovenly Swede stepped off the lower step, the accommodation resumed its progress eastward.

Leading off at right angle from this singular station was a small branch line linking the main line with the Montauk Division at Eastport, a distance of nearly six miles. On this remote diverting branch the telegraph company maintained a comparatively unimportant, diminutive line, and it was now due for an overhauling. Primarily it was necessary to reinsulate the line in various sections to bring it into a better state of efficiency for good wire service. As the timber (poles and arms) were in moderate good condition and as the wire showed no convincing evidence of deterioration, the only material which was brought out of the storehouse at Long Island City were the insulators, which the big Swede was now toting to the waiting Eastport train.

"Don't drop that bag, Jensen," commanded Sullivan, turning around unexpectedly as he was drawing nearer the car, for Jensen, in shifting the heavy load from one shoulder to another, had nearly relinquished the bag containing the glassware. "If you do, your goose is cooked," he added, threatenly, as he hopped up the steps of the accommodation. Affecting not to hear his superior, Jensen took a securer grip on the neck of the bag and struggled with his load up the steps right at the heels of the anxious boss.

Continuing through the aisle to the baggage car, Jensen carefully lodged his bundle on the floor and sitting down he proceeded to smoke placidly as the train drew slowly out of Manor, the rest of the climbers and grunts taking possession of the smoking car, whereupon they proceeded to imitate Jensen's example, but occupying more pretentious quarters than was assigned to the unforunate Jensen, the new "grunt."

It was to be a brief respite, however, for the men had anticipations of getting very busy in a few minutes, as one of their number, who was perched in the cab of the engine, was about due to sight the first bad spot on the line, and the train would slow down to permit the gang to detrain. It seemed as if they had just sat down and composed themselves when the train, under the instructions of the lookout ahead, slowed down precipitately and they realized this was the time for the hop-off. With a curt command, "Come on, now; here is where we get off," Tim Sullivan burst out of the car and nimbly swung himself off the steps. The gang, only burdened with their light climbing accoutrements, emulated his swift example and were soon collected alongside of their foreman on the railroad embankment. The first bad condition had been definitely located and the gang was ready to work, the climbers being only too eager to commence, were even now strapping their spurs on and adjusting their safety belts.

Amid the confusion due to their abrupt departure, little thought was given to the new recruit, who had isolated himself in the baggage car, and who was thought to be zealously guarding the precious double-petticoated insulators which were soon to be installed on the crossarms of this branch line, but, alas! fate decreed otherwise—Jensen had to be reckoned with. He was to prove Sullivan's Nemesis that day in an abundant measure. Not per-

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ceiving the big Swede with the sack among his charges, Sullivan quivered with rage and began to call down curses on the Swede's head, who was oblivious of this tirade and illegant tribute paid him in his absence. "He is still in the baggage car," volunteered one of the climbers. Not waiting for further information, Sullivan frantically ran alongside the moving cars, which were now getting away from him. By almost superhuman effort he managed to get opposite the open door of the baggage car. "Come out of there, you big Swede! Out with the bag!" he gasped, and then fell back, panting, into the ditch. The Swede, who had seated himself on top of the bag, had promptly gone to sleep when he first came aboard. This peremptory summons from the outside startled him into semi-wakefulness. He became confused and utterly irresponsible, and, heedless of the foreman's entreaty to be careful with the bag, he sluggishly arose and with a convulsive heave the loaded bag was tossed out of the open door, just grazing Tim Sullivan's devilish countenance as he was laboriously ascending from the ditch where he had fallen from the top of the embankment. With a detonation that could be heard in Greenport, a mass of broken glass in a burlap bag lay huddled at the foot of the embankment; a day's work thrown overboard in but a fraction of a moment by a crazy Swede. Not realizing the gravity of his bonehead work, Jensen vaulted out of the baggage door, to be confronted with a clean-gone-mad, much-disheveled foreman, who fumed and swore at him until the very air of the pines and oaks was defiled with his foul obscenity. Tempering down to a semblance of sanity, Sullivan managed to splutter: "You howling Squarehead! You seagoing cook! See these grinning grunts and spur pushers! Well," he finally articulated, "you gave them mutts what they were looking for—a day off. Yes, damn you, you get a lifetime off. Get out of here, you're fired."

Crestfallen after the heavy lacing his lordly superior had handed him, Jensen was rendered speechless, but without a semblance of a retort other than focusing a malevolent eye on Tim, Jensen lunged up the tracks toward Manor, to be gone out of their lives forever, but leaving a very pleasant memory in the minds of Tim Sullivan's men.

A track walker patrolling his section that afternoon was astonished to see a row of men sitting at ease along the railroad tracks. They were smoking and swopping yarns at a time of day far removed from the noon hour.

It was an untired and greatly refreshed bunch of linemen which departed homeward from Eastport that afternoon, after having spent a delightful, unsolicited vacation, and they were in a happy frame of mind as they smoked and discussed the fate of the hapless Swede. Foreman Tim Sullivan, on the contrary, who had chosen an isolated corner of the car for his sober reflections, viewed with despair his approaching meeting with his superior at 195 on the following morning, where he was to answer for that one wild fling of the big Swede.

The Telephone Cable Connecting Key West and Havana

"Through the laying of three black, prosaic-looking cables under the hundred miles of sea water that separates Key West from Havana has little of romance in it to the casual observer, it represents an important step in man's conquest of space and time," says a bulletin issued from Washington headquarters of the National Geographic Society.

"These cables will for the first time carry the voices of mainland America to the 'Queen of the Antilles' and bring back answering voices; and at the same time they will be carrying the sound of spoken words for a greater distance under water than they have ever been carried before. It is the latest chapter in the far-from-finished story of man's struggle to filing his thoughts—and even the intonations that measure his feelings—to his fellows at the ends of the earth.

"Progress is spanning the salt water that divides the world into what were once 'idea tight' compartments—and which now know the gossip of each other's market places, forums and boudoirs as soon as they are known at home—started in earnest only three-quarters of a century ago after Samuel F. B. Morse proved with the telegraph that distances over land and under sea were slight barriers to exchanging signals.

"The first efforts to realize Morse's prediction, in the late forties, were failures. Because neither cable-making nor cable-laying had been mastered, the cable broke again and again, the broken end was finally abandoned in mid-Atlantic. The first commercially successful submarine cable was laid as the result of the much less ambitious desire to connect England and France. This cable, about twenty-five miles long, was laid under the Straits of Dover in 1851.

"In 1857 Europe and America were first connected by cable and messages were exchanged for several months. But the insulation of the cable was destroyed by currents of too great strength and the two continents were again without electric communication for nearly ten years.

"Europe remained without cable news from the United States during the Civil War, but in 1866 the Atlantic was finally electrically bridged, and the connection between the Old and New Worlds has since been continuous. In 1869 a cable was laid from France to the United States.

"In 1902 the greatest of cable-laying projects was undertaken—the crossing of the Pacific. The first Pacific line was laid by a British company from Vancouver, British Columbia, to Australia, a distance of 7,800 miles.

"While cables were being laid under the oceans and telegraph wires strung on land, Alexander Graham Bell invented the telephone and there was added the desire to connect water-separated countries by this more intimate means of communication.

"Within the last few years the invention of the Pupin loading coils and the Audion amplifier has opened new possibilities in underwater telephony, and now longer telephone cables are being laid."

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Wireless Waves

By Lt. Col. C. G. CRAWLEY, R.M.A.

In wireless signalling, energy is transferred from the sending station to the receiving station without any transference of matter, in an exactly similar manner to that in which light, heat, or sound is transmitted from one place to another.

In each case the energy is transferred by wave motions in the intervening medium.

Now, light and heat are transmitted from the sun to the earth not only through the atmosphere, but also through millions of miles of empty or vacuous space, so that the medium for the propagation of light and heat, whatever it is, is not a solid, a liquid, nor a gas, but must be something which is present in a vacuum.

The existence of a medium with these properties is, therefore, a fair assumption to make, unless, or until, some observed phenomenon requires its modification.

In this connection, for instance, it is possible that the result of recent observations of the sun's eclipse may require some modifications to be made in certain assumptions regarding the transference of energy by ether waves.

The energy which produces sound is also transmitted by wave motions of a medium, which in this case, however, is gaseous (as air), or solid, or liquid.

The difference in the media in the cases of sound and light can be readily demonstrated by connecting up an electric bell and its battery under the receiver of an air-pump so that the space surrounding the bell, enclosed in the glass receiver, can be exhausted as far as possible of air. It will be found that, as the air becomes more and more rarified, the sound of the bell decreases, eventually ceasing altogether when the receiver is exhausted of air. The hammer, however, can still be seen striking the bell, which shows that light is traversing the exhausted space, whereas sound is not.

The method by which energy can be transferred by wave motions in a medium can be seen by dropping a stone into a pool of water. The energy imparted to the water by the stone is radiated in the form of a circle of waves, the circle increasing in size, and the heights of the waves becoming smaller until they reach the edges of the pool, or die away altogether. Now, if some corks are floating in the pool, the energy imparted to the water by the stone, and propagated by the waves, will cause the corks to bob up and down, thus showing that the little particles of water, which are in this case the medium, merely oscillate up and down, and by doing so, convey energy in the form of waves, the corks nearer the original disturbance receiving more energy than those farther away.

The stone, by disturbing the water at one place, has thus transferred energy to other places by waves in the medium, the water, without any transference of matter taking place.

Similarly, if one end of a piece of rope is fixed, and the other end is rapidly moved up and down by hand, energy is transferred by wave motions in the rope from the hand to the place where the rope it attached without any matter being transferred from the one end of the rope to the other.

In both these cases the wave motion by which energy is transferred is produced by oscillations of the little particles which make up the medium—that is, the water or the rope, up and down at right angles to the line of propagation of the energy. A wave length is the distance separating the crests of the adjacent waves, and it will be apparent, by observing the motions of the rope, that the more rapid the oscillations the shorter are the wave lengths, and vice versa.

It is in just such a manner that light and heat are transmitted from, say, the sun to the earth, except that the oscillations of the medium, in this case the ether, take place not only in one direction but in all directions at right angles to the line of propagation.

If the oscillations of the ether are at certain rates, they affect the eye and produce the sensation of light; if at certain other rates, they are received not as light, but as heat.

If the ether is set in oscillation at very much slower rates than can be detected as light or heat, the ether waves produced are those which are used for communication by Wireless Telegraphy. These wireless waves are often called Hertzian Waves, after Hertz, a German physicist, who in 1878 published the results of his experiments on the production and properties of these waves, results which confirmed theoretical deductions published by Clark Maxwell in 1864.

The transference of energy by all these ether waves, light, heat, and wireless, takes place at the same rate, viz., 186,000 miles a second; but the rates of oscillation of the ether on which depend the lengths of the waves differ very much in each case.

The highest known rates of oscillation in the ether produce Rontgen or X rays, then come the actinic waves, which are used in photography, and then the visible light rays, at rates of oscillation from about 1,200 billions a second for violet light, down through indigo, blue, green, yellow, and orange, to about 600 billions a second for red. A combination of all these color rays produces white light—i. e., sunlight. Below these rays of oscillation are the heat rays, and then the rates of oscillation, about 3 millions to 15,000 a second, which produce the Hertzian waves now used for wireless signalling.

These wireles waves are, therefore, very similar to heat or light waves, and travel at the same speed, the main difference being that the rates of oscillation of the ether which produce them, though so exceedingly rapid, are far too slow to produce the sensation of heat or light; in other words, these wireless waves can be neither felt nor seen. Neither, of course, can they be heard, as they have

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no connection whatever with audible sounds, which are produced, not by ether oscillations, but by air oscillations, acting on the drum of the ear.

Signalling by an unscreened flashing lamp may be taken as an example of signalling by light waves, flashes of short and long duration representing the dots and dashes of the Morse Code. These flashes consist of trains of ether waves which radiate in all directions at a speed of 186,000 miles a second, the oscillations getting weaker and weaker as the distance from the lamp increases, until at last they have dissipated their energy and die away altogether. The eye can be used to receive these signals, and the message in the Morse Code can be read simultaneously from all directions by any number of people within range, provided that there are no screening effects caused by opaque bodies intervening between their eyes and the lamp.

Wireless signals are sent in a very similar manner by short and long trains, or series of trains, of ether waves which travel outward from the sending station in all directions at this same speed of 186,000 miles a second. These trains of waves actuate, at dots and dashes, according to their duration, the wireless receiving instruments at any number of stations which are within range, and are adjusted to respond to the particular wave length used.

These long ether waves are able to pass readily through bodies which are opaque to light or heat waves, unless such bodies consist of, or contain, conductors of electricity, in which case the waves produce currents of electricity in the conductors, and so part with some of their energy.

Screening effects in the case of wireless waves are, therefore, very different from those which obtain in the case of light waves; for example, buildings, etc., opaque to light waves, may present no obstacle whatever to the passage of wireless waves; even mountains, and indeed the obstacle caused by the earth itself, do not affect these waves in the same way as they affect light waves.

For instance, there is not difficulty in signalling by wireless waves across the Atlantic, whereas it is impossible to signal over distances of more than a comparatively few miles by light waves, owing to the earth imposing, due to the curvature of its surface, an impenetrable obstacle to such waves. In the case of the Atlantic Ocean this obstacle would represent a mountain some hundreds of miles in height, and the waves do not actually pass through this obstacle, but may be considered as gliding over the surface. Like light waves, they are subject to absorption, to reflection, and to other forms of bending, as refraction and diffraction, on account of which mountains or other high land close to a wireless station may produce serious screening in that direction, whereas the same obstacle at a distance may have very little or even no appreciable effect. Short waves are much more affected by this land screening than are long waves; but in any case it is advisable to avoid siting a wireless station close to higher ground in a direction toward which communication is required.

Absorption and bending effects in the atmosphere account for the fact that signals, especially when using short waves, can be transmitted to much greater distances by night than by day, and that these night ranges may vary considerably during the same night, and from one night to another.

For signalling by wireless, the sending station does not transmit a number of ether waves of various lengths at the same time, as is the case when signalling by light, but makes use of one wave length only for that particular transmission.

All wireless communication is not, however, carried out on the same wave length, as if it were the receiving stations would receive a jumble up of all the messages being sent on that wave length from stations within range, instead of the particular message which it was desired to receive. When the reception of a message is thus interfered with by other messages being sent at the same time, the message is said to be "jammed." This jamming of a message may also be caused by stray ether disturbances in the atmosphere itself. These disturbances are called "atmospherics" or "strays," and are especially strong when thunder-storms are in the vicinity, lightning itself causing very violent atmospheric disturbances. Atmospherics often cause great interference with wireless communications, and in tropical countries are sometimes so strong as to prevent any communication at all for hours at a time. They are strongest, as a rule, at night and in the afternoon. In more temperate latitudes, as in this country, atmospherics are usually at their worst during the night in summertime, but are seldom so troublesome as those experienced in warmer climates.

The actual choice of the wave length will depend on various considerations—for example, high-power long-range stations cannot be arranged to transmit short waves, and low-power short-range stations, such as those in ships, cannot be arranged to transmit long waves.

All commercial ship and coast stations are fitted so as to be able to transmit on wave lengths of 600 and 300 metres, the intention being that communication, if jammed on the one, may possibly be established on the other.

The S.O.S., or distress signal, is always sent on the 600 metres wave, as this is the wave length for which the receiving apparatus in all ships is normally adjusted.—*St. Martin's Le Grand.*

THE International Bureau of Communications, located at Berne, Switzerland, has just issued a map showing the cables of the world. The map measures 21 inches high by 35 inches wide. There are fifty-five submarine cables shown on the map, Copies can be obtained at 50 cents each from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

A FRESH mind keeps the body fresh. Take in the ideas of the day, drain off those of yesterday.

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Student's Course in Technical Telegraphy

By Louis Casper.

Lesson 23

In the preceding lessons covering various measurements for fault localization, more particular reference was made to open wire testing.

It is a well-known fact that the copper conductors of cables, which may be often aerial (lead or rubber covered) underground, or submarine variety, form part of a large proportion of our telegraph circuits.

Indeed, many of the so-called open lines include a combination of all the types here mentioned.

In the study of fault localization, therefore, a brief description of a few useful and simple methods for finding "spot locations" (after a Wheatstone bridge or a Murray test has been made) may prove more or less helpful to the aspiring student.

On aerial and rubber-covered cables this "spot" location is quite important. With underground cables, as a general rule, testing for faults is only made between manholes and does not require the application of the "spot" location principle.

It does not happen very frequently that a cross between two conductors of a lead cable is a solid one, thus forming a perfect metallic circuit. There is usually a medium of charred paper insulation or carbonized compound through which a cross takes place. This also applies to conductors crossed with the lead sheath of the cable. If a current of considerable volume (say anywhere from 75 to 100 milliamperes) is connected with the faulty conductors for any length of time, the latter will become

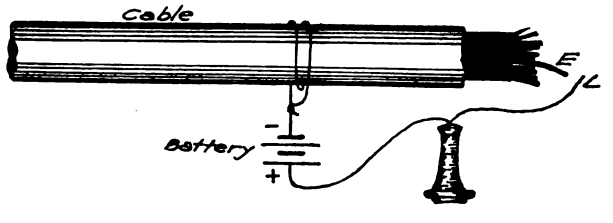

FIG. 52

more or less heated at the spot where the fault occurs, and may thus become manifest to the sense of feeling. A test of this character is often very useful in cases where the sheath of the cable shows no signs indicating the location of the trouble.

Faults that occur in cables are caused by a breakdown in the insulation, resulting in "ground leaks" when conductors are in contact with the sheath of the cable. The term "wet spot" is applied when the insulation resistance of conductors becomes lowered owing to moisture penetrating the cable through cracks or holes in its sheating. "Shorts" or "crosses" develop when two or more wires come directly in contact. "Split" pairs occur when the two wires of any pair are separated and spliced to wires of separate pairs, and "opens" occur when wires are broken and separated or a failure to splice a conductor through at a cable junction or branch station.

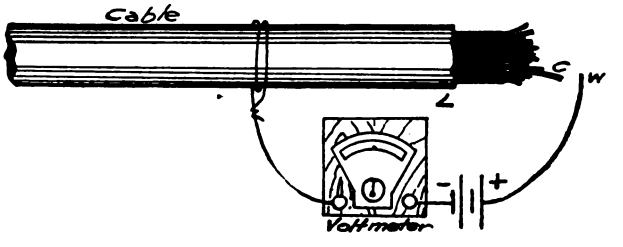

FIG. 53

In testing for leaks or grounds, the cable conductor should be disconnected from the open line at the distant end of the cable and the test applied directly to the conductor from the end opposite to the spot where the disconnection has been made.

Test With a Telephone Receiver and Battery

An extremely simple method to determine whether or not the insulation of any particular conductor is high or low, is as follows:

A telephone receiver and battery are connected as shown in Fig. 52, where one side of the battery is attached to the lead sheath of the cable or ground and the other side to a telephone receiver. A rubber-insulated wire is attached to the other side of the telephone. To apply the test, hold the telephone receiver to the ear, and touch the conductor E (which is to be tested) with the wire L. A "click" will always be heard the instant such contact is established.

After keeping both wires in contact for several seconds, separate the wires and make connection once more. If no sound is heard at the instant of reconnection, the wire may be regarded as clear. The "click" mentioned is due, at least in part, to the charging current which enters the wire in the cable. Now, if the insulation resistance of the wire in question be good, this electrical charge is not soon dissipated, hence during the short interval of time between the "break" and "make" the cable has not had time to fully discharge its accumulated

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electricity, and, therefore, retains a considerable portion of the initial charge, thus preventing the reception of such an *additional* amount as would sensibly affect the telephone at the instant of re-connection. If, on the contrary, the conductor is faulty, there will be a decided "click" each time the connection is made. With intervals of time between "break" and "make" of one second with a battery of one volt it can be assumed that no click means at least an insulating resistance of 50 megohms. When more battery is used this figure is increased in proportion to the number of cells. This method should always give practical evidence whether a cable is good or bad. Care must be taken that the sounds in the telephone, due to induction, are not misconstrued for those produced by leaks.

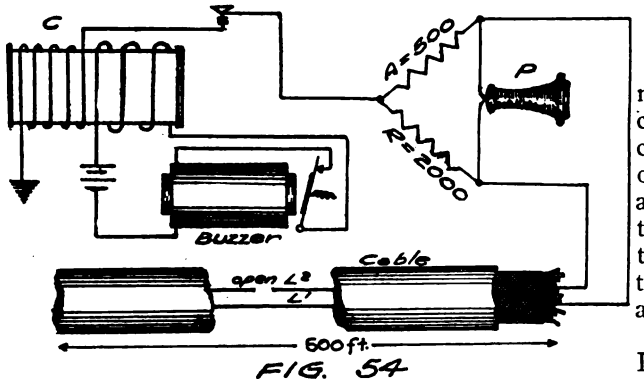

FIG. 54

Testing Cables With Voltmeter

The voltmeter is a convenient and satisfactory instrument for determining faults which have a resistance from 1,000 ohms to several megohms. The usual testing battery is from 160 volt motor-generator or storage battery, which gives quite accurate results. Voltmeters should have a resistance of at least 10,000 ohms.

Fig. 53 shows the arrangement of the battery and voltmeter with respect to the cable, unless, however, a large battery is employed, this method cannot be used to measure more than a few megohms.

The formula that applies is as follows:

Let R = Resistance of the voltmeter
A = The voltmeter reading with the wire W connected to L.
B = The voltmeter reading with the wire connected to C.

Then the resistance of the fault would be

$$\frac{A-B}{B} \times R$$

Locating "Opens" in Cables by Bridge Method

Probably the most simple test of a bridge measurement to locate an "open" conductor in a cable is shown in Fig. 54. The arrangement can be easily and cheaply rigged up.

The arm A is a fixed resistance of known value. The arm R is a rheostat of a wide range of adjustment. A buzzer is connected on one side of its coil to the primary winding of a small induction coil, commonly used in telephone apparatus. The opposite terminal of the buzzer coil is connected to a small local battery which in turn connects with the opposite terminal of the primary winding. One terminal of the secondary winding is grounded and the opposite terminal is connected to the apex of arms A and R through an interrupting key.

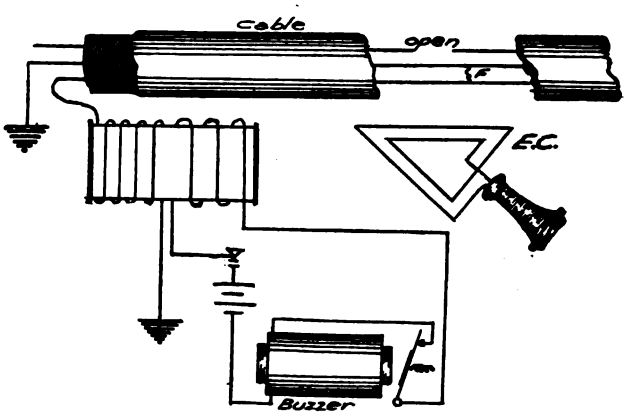

FIG. 55

Connections are made with one good conductor L^1 and the "open" conductor as shown.

When a balance is obtained (which is accomplished by varying the resistance A) there will be no longer any noise in the telephone receiver P, and A will then bear the same inverse ratio to R as L^1 does to L^2. Hence the following formula applies:

$$F = \frac{A \times D}{R}$$

Where F = Fault
A = 1st Bridge Arm
R = 2nd Bridge Arm

Reduced to figures, assuming that Coil A = 500 ohms, R = 2,000 ohms, and the length of the cable is 500 feet:

$$\frac{500 \times 500}{2000} = 125 \text{ feet}$$

Tone Tests For Locating "Opens" in Cables

A very convenient and simple device is shown in Fig. 55 for locating "spot" openings or crosses in cables.

An induction coil similar to that shown in Fig. 54 is provided. The primary winding is similarly connected up with a local battery and buzzer. If it be desired to locate a fault (as shown in Fig. 55) one faulty conductor is grounded, and the other connected to one terminal of the secondary winding

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of the induction coil, the opposite terminal being grounded.

In the event it is desired to locate an opening, a good conductor and the "open" conductor are connected to the secondary terminals of the induction coil.

A search is then made by passing a coil of insulated wire connected to a telephone receiver in close proximity to the cable sheath. The coil of insulated wire should consist of a considerable number of turns and the telephone receiver should be preferably of the wireless type of about 500 ohms resistance.

The telephone receiver should pick up the noise occasioned by the buzzer vibrations through the induction coil, and the noise will either cease or be greatly diminished just as soon as the fault has been passed.

This method has proven to be of great convenience as a means of identifying a faulty cable among a group of the same in subways and other underground passages, through which the cables are laid. A faulty strand in a submarine cable can also be located in this manner after having been grappled with and brought to the surface.

(*To be continued*)

Confidence

The future belongs to the confident man, for the fight lies straight in front of him. His feet are on the ground and there are no distractions. Uncertainty feeds on hope. A theory is at best only a beginning whose points of departure cannot be known. A condition is a fact and the roads that lead from it are facts. Where there is only one road, there can be no uncertainty—no mistakes.

Starting from a position with its back to the wall the road for business now is forward. Divergent aims make concert impossible. Try as it will, a mass cannot move in opposing directions. Business must move together, stand still or die. In the present situation, deflation, the process of getting down to bedrock, is stymied. A few of us have gotten between the rest of us and the goal, hoping to join the advance without having joined in the retreat. It can't be done. We must all get back to scratch —bedrock—play in turn and according to the rules. Those who hesitate want to save something they never had. We are awaking from an economic nightmare. As long as the dream lasted, dream-wealth maddened and unbalanced some of us. We mistook a bacchanal for a quiet afternoon in Elysian fields. The carousal is over. Those of us who do not know as yet that some of our gold has turned to leaves are hoping that George will get to work. But the magic lamp is wickless and without oil. We face the necessity of starting the day with a wash at the old pump—a thing that will strengthen our soul for the test that lies before us. We should meet the situation with confidence—the trail-blazer of progress.

Turn the pages of history and note the record. Confidence was and is a condition precedent to every worth-while achievement. The archaeology of the past records its accomplishment no less than the vellum of today. Its majestic tracery is the footprint of time. Every material expression of genius has found its genesis in confidence. Through it we find a Newton measuring the comet's path, a Franklin stealing fire from heaven, a Columbus in search of a new world. It has won wars, defeated famine, built empires, created government, subjugated the waters of the earth, made conquest of the air and converted man's habitation into a garden of roses. It is a legacy from those from whom we are descended—let us not be truant to the trust.

Jones' Book of Diagrams

The text-book of the telegraph profession, "Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, is by far the most popular electrical book on the market. This standard work has been carefully revised and brought up to date, and includes full descriptions of the newest apparatus adopted by the Western Union and the Postal Telegraph Companies. It presents the finest study of the telegraph ever published; it explains clearly the equipment of a modern telegraph office, and is a text-book that no student, operator, engineer, or official can afford to be without; 64 chapters, 488 pages, 250 illustrations. A new edition issued in April, 1918, includes an appendix of 24 pages, containing 16 illustrations, covering the new Western Union Multiplex System. Price $2.50 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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American Telephone and Telegraph Company's Annual Report

The Bell telephone system is a single nation-wide system, and the American Telephone and Telegraph Company is the parent company. The associated companies are the successors of the original licenses. The American Telephone and Telegraph Company has the widest distribution of stock ownership of any corporation in America, having 139,448 stockholders at the end of 1920. The companies' property was returned to private operation in 1919, and in 1920 total operating revenues of the combined companies amounted to $449,442,115. Operating expenses and maintenance costs reached $346,819,617, and the net balance after paying interest charges, taxes, etc., available for dividends was $47,785,065.

Detailed comparisons between 1919 and 1920 are not possible, because for the first seven months of 1919 the American Telephone and Telegraph Company and subsidiaries were operated by the government, and the corporations' revenue consisted of a fixed rental. Keeping this in mind, net income available for dividends for the entire calendar year 1919 amounted to $51,957,565. Taking the American Telephone and Telegraph Company alone, however, there was $11.70 a share available for dividends in 1920, contrasted with $10.10 a share in 1919.

The balance sheet of the American Telephone and Telegraph Company, when combined without duplication with the subsidiary companies, shows the financial condition of the Bell system. This system has outstanding $511,493,407 capital stock, $213,571,750 mortgage bonds, $164,396,100 collateral trust bonds, roughly $80,000,000 convertible bonds, $37,000,000 debentures, and $9,000,000 three and five year notes. Against this it has a telephone plant valued at $1,363,826,327. In this connection President Thayer says: "The assets of the associated companies so far exceed their capital (securities outstanding) that 8 per cent. on their investment as a whole would produce enough to pay 10 per cent. dividends with a fair margin; no one of the associated companies pays more than 8 per cent dividends."

Maintenance of the integrity of this huge investment would appear to depend, first, on fair treatment of the company by the public authorities with power to regulate its rates; second, ability to keep within the system new inventions and to develop old inventions and methods, so that the American Telephone and Telegraph Company can always keep in the lead in the science of the transportation of verbal or written messages; third, on the maintenance of the vast human organization required to operate the plan, and, lastly, on the physical upkeep of the plant, which is valued at $1,250,000,000.

The first of these requirements is intangible, but students of the relations between the public authorities and public utilities are fairly generally agreed that the most important element in obtaining fair treatment from public authorities is to render satisfactory service to the public. President Thayer says: "Hardly a day has passed since the organization of the Bell system which did not record somewhere in the system some act that strikingly illustrated spirit of loyalty to public service. This thought of 'service first' is more than devotion to an organization, inspiring as that may be. It comes from a sense of individual responsibility in the public service. This type of loyalty is one of the finest traditions of the Bell system."

These remarks of President Thayer are made in connection with comments on the establishment of the Theodore N. Vail memorial fund, the income from which is to provide medals to be awarded from time to time to employees for unusual acts of service.

The problem of keeping in the van as regards inventions has been one to which the American Telephone and Telegraph Company has given money and time. The department of development and research, including the laboratories of the Western Electric Company, employ about 2,800 people, of which 1,100 are engineers, chemists, physicists and other scientists. The Western Electric Company is the subsidiary which manufactures apparatus, etc., for the Bell system, and 98 per cent. of its stock is owned by the American Telephone and Telegraph Company. As an illustration of what the research department is doing: Two experimental radio telephone transmitting and receiving stations have been erected on the Atlantic coast and two ships running from Boston to Southern ports have been equipped with apparatus, so that communication has been maintained with the two stations on shore.

Progress has been made toward devising a method whereby radio telephone messages can be rendered secret, and conversations have actually been carried on by the American Telephone and Telegraph Company's engineers where ordinary receiving stations could hear nothing but unintelligible sounds while those stations equipped with special apparatus and operation information could hear and understand spoken words.

What has been said about the establishment of the Vail Memorial Fund illustrates what the company is attempting to do in the way of keeping its human organization up to a high standard. Another illustration is the employee's benefit fund established in 1913 and which has paid out $17,228,399 since the beginning of 1913 to employees. There were 455 employees on the pension rolls at the end of 1920, and from this benefit fund are paid not only pensions, but sickness allowance, accident benefits and death benefits.

In 1920 the combined system spent $69,665,080 for current maintenance of plant and charged $65,731,071 for depreciation.

IT WAS an old saying of A. B. Smith, manager of telegraphs, who recently died at Montreal, that "It is better to wear out than rust out."

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EDITORIAL COMMENT

ON ANOTHER page will be found an article, which will doubtless be of considerable interest to our readers, on "Railway Time Service," by H. Hulatt, manager of telegraphs, Grand Trunk Railway System, Montreal, Canada, who, for several years, has had charge of time service matters, not only on the Grand Trunk System, but also on the Grand Trunk Pacific Railway.

Mr. Hulatt has made a close study of this branch of railway service, having developed an extremely efficient time service system, which differs, in many respects, from that in effect on other railroads, but which has been adopted by several roads in America and by more than one important road in foreign countries. We are hoping later to receive from Mr. Hulatt a further article analyzing the important principles to be observed in inaugurating a successful time service system, and a description of the system in effect under his jurisdiction.

The Island of Yap

The Island of Yap, which is the subject of international controversy on account of its importance as a cable station, is about ten miles long, and about seven thousand persons live there, probably less than one hundred of whom are white.

The island is 700 or 800 miles east of the lower part of the Philippines. Roughly speaking, it is 1,500 miles north of Australia, 1,500 miles south of Japan, half as far to the east of the Philippines and about 500 miles south of west from Guam. It is on the way from the United States to the Philippines, and is a station in the former German cable system linking Guam with the Celebes, Japan and Shanghai.

The island was bought from Spain by Germany in 1899, and was by the latter turned over to the Allies in 1919.

United States Tests British Claim to Wireless Monopoly in China

United States Minister Charles R. Crane, at Peking, China, acting on instructions from Washington, on March 5th handed the Chinese government a statement, informing it that the directorate of the American Federal Wireless Company has ratified the agreement entered into by its representatives and the Chinese Ministry of Communications for the erection of a high power wireless plant at Shanghai.

Much significance is attached in China to the notification of the American government, as the United States is virtually making this a test of the British claim to a monopoly in wireless construction in China.

Aurora Borealis

The effects of the recent display of the aurora borealis was promptly felt in the offices of cable, telephone and telegraph companies, communication being interfered with. Wireless service was also affected, but in a less degree.

Scientists have little to say in explanation of its occurrence, except that it is the result of magnetic activity in the upper region of the earth's atmosphere, these disturbances, in turn, being mysteriously associated with the frequency of sun spots.

The Electron Theory of Matter

Professor Karapetoff, of Cornell University, recently emphasized the point that it is easy enough to evolve a theory that would explain various known facts *qualitatively*. The real difficulty consists in assigning such numerical values to the various parts of the assumed mechanism that widely differing facts be satisfactorily explained *quantitatively*, without contradictions. A mathematical analysis of experiments is necessary in order to derive such numerical values. Those who set out to become familiar with the electron theory usually get discouraged not because the hypotheses involved are too complicated, or the leading experiments too obtuse, but because the mathematics which accompany the treatment seem too advanced or not convincing. For this reason Professor Karapetoff devoted a lecture recently to the elucidation of some of the mathematical methods used in modern electron theory.

According to this theory an electron is an elementary particle charged with negative electricity, or actually consisting of negative electricity. Atoms of matter are supposed to be built up of such electrons and of a positively charged nucleus in the center. An atom in its structure is similar to a solar system. First of all it was shown how the charge on an electron may be computed to a high degree of precision from the well-known "oil-drop" experiments of Professor Millikan. Then he showed how the speed and the ratio of charge to mass of an electron may be determined from J. J. Thomson's experiments in a cathode-ray tube. The radius of the electron is then readily computed from these data, using ordinary laws of mechanics and electromagnetism.

BANDITS recently stole a heavy safe from a Western Union telegraph office and carted it to the woods a few miles distant, and where, after laborious work, succeeded in opening it, only to find that it contained less than fifty dollars.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

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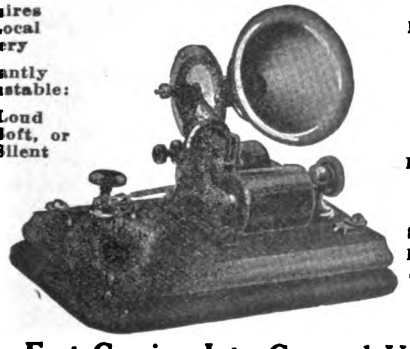

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THE RAILROAD
TELEGRAPH AND TELEPHONE

W. O. CUTLER, train dispatcher of the Rutland Railroad, Rutland, Vermont, has been appointed acting superintendent of telegraph of the same interests, vice S. F. Colton, deceased.

S. R. HENDERSON, superintendent of the Chicago and Alton Railroad, Bloomington, Ill., has inaugurated a code system to reduce the pressure upon the telegraph department. A code word takes the place of ten to fifteen words and reduces a message that ordinarily runs fifty to seventy-five words to a dozen or less.

THE New York Central Lines telegraph department engineers committee met in New York March 4th to talk over general engineering plans. Those present from out of town consisted of: J. G. Gilgrist, assistant superintendent of telegraph, Big Four Railroad; John L. Niesse, telegraph and telephone engineer, Big Four Railroad, Indianapolis; W. A. Jackson, assistant superintendent of telegraph, Michigan Central; C. E. Baxter, telegraph and telephone engineer, Michigan Central, Detroit; A. Behner, telegraph and telephone engineer, New York Central Lines, Cleveland, Ohio; G. T. Stanton, assistant engineer, Toledo and Ohio Central Railroad, Columbus, Ohio, together with Stanley Rhoads, telegraph and telephone engineer, New York.

THE committee of direction of the telegraph and telephone section of the American Railway Association will hold a meeting at 431 South Dearborn Street, Chicago, at 10 A. M., Wednesday, April 6th, at which time various routine matters will be acted upon. This is the first meeting of this committee since the activities were suspended, on account of necessity for reduction of expenses due to the recent slump in railroad earnings. Many matters of importance to the telegraph and telephone section will be acted upon which have accumulated during the past few months.

IT is expected that the Bureau of Standards of the United States Government will issue, within the next month, a revision of its National Electric Safety Code. Upon receipt of this revision, it is the intention of sub-committee B of committee No. 1, construction and maintenance of outside plant of the telegraph and telephone section of the American Railway Association to revise the association's specifications for wire crossings over railroads, conforming as closely as practicable to the revised rules of the Bureau of Standards, so as to bring about uniformity of practice. It is expected that the various states, railroad and public service commissions may adopt the American Railway Association wire crossing specifications. This will bring about considerable advances over the existing specifications designed in accordance with the fundamental engineering principles generally followed in construction and maintenance work.

A BILL was recently presented for consideration in the Ohio Legislature establishing a position of general inspector of all electrical work, which was so broad in its scope that, if enacted into law, would have proved very burdensome to the electrical industries and interfere with the operation of railroads. The bill evidently was designed to furnish a political position. All proper representation to the Legislative Committee was made on the part of the electrical contractors and railroad officials, and the iniquities of the measure were shown up in such a way as to have action deferred upon it. A similar bill was presented for passage by the Legislature of the State of Oklahoma. The outcome of this bill is still in doubt. It is suggested that all of the financial burdens that the railroads are now subject to should not be increased by passing unnecessary legislation.

The Atomic Code

The Atomic Code, price $10.00 per copy, has just been placed on the market by the author, Sidney J. Williams, an expert cable code maker, of New York. The author recognizes that one hundred per cent. economy is not possible in conjunction with one hundred per cent. safety, but he claims that codes compiled on this system give the highest obtainable percentage of both economy and safety.

The code is compiled on the Atomic System of coding the desired text by means of pairs of letters. These pairs are cabled in groups of five pairs, making ten-letter words which are always pronounceable because in each pair of letters is one vowel and one consonant. Copies of this code may be obtained at the office of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

The Cuban Telephone Cables

Tests of the recently completed telegraph and telephone cable between Havana and Key West have proved satisfactory, it is declared by officials of the Cuba Telephone and Telegraph Company. Inauguration of the new service is expected in a few days.

The new enterprise, which will make possible telephonic conversations between Cuba and any part of the United States, cost approximately $2,000,000.

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Railway Time Service

By H. HULATT,
Manager of Telegraphs, Grand Trunk Railway, Montreal.

In recent years, by far the greater proportion of the railroads in the United States and Canada have spent large sums of money on what is known as "SAFETY FIRST" work, with a view to not only educating their own officers and employees in the principles of safety, but also the public, and their work in this connection, due to the publicity necessary to ensure success, is well known.

The "time service department," although it can proudly claim to be the pioneer "safety first" department of all railroads, can also undoubtedly lay claim to the dubious distinction that it is one of the least known departments, and the importance of its work less appreciated, not only by the public, but, very often, by the rank and file of a railroad.

There is an old saying that "Efficiency is the conservation of time," and in no branch of human endeavor does correct time occupy such an important place as in the operation of a railroad, in connection with which a difference of only a few seconds may result in the injury and possible death of employees and passengers.

Years ago, when operating conditions on railroads were less strenuous, and trains did not travel at such fast speeds, little or no effort was made to ensure that those responsible for the movement of trains had equipped themselves with reliable watches—in fact, it was not uncommon for the only timepiece on a train to be an alarm clock hung up beside the engineer at his seat. Frequently, if the train crew was not sure of the time, they would go on to a siding and send the fireman over to a farmhouse to find out what the time was.

This condition of affairs continued until the inevitable happened, namely, serious wrecks, and heavy loss of life, and the origin of watch inspection may be said to date back to some time between 1890 and 1895, as the result of a serious wreck to a mail train on a prominent eastern road in the United States, causing several deaths, and to an equally serious wreck on a Pacific coast road, both wrecks, after investigations, being found to be due to defective timepieces.

As a result of the investigation as to the cause of the wreck on the eastern road, an expert watchmaker of Cleveland, Webb C. Ball, by name, was called upon to make a thorough examination of the watches carried by conductors and engineers on the road in question—it has been the writer's privilege to peruse a copy of the report submitted—and, to the railroad men of today, it would seem impossible that conditions as disclosed could possibly have prevailed. Suffice it to say that several engineers were found running with cheap watches which an enterprising tailor gave away with every suit of clothes purchased from him.

The outcome of the examination made by Mr. Ball was the inauguration, under his supervision, of a system of watch inspection, the lead of the road in question being more or less promptly followed by practically all the railroads on the North American Continent, the majority of the roads in the States placing such branch of their service under the supervision of Mr. Ball, who, from the small beginning indicated, has developed what is now known as the Bureau of Railway Time Service.

In Canada, both the Canadian Pacific Railway and the Grand Trunk Railway System have maintained, for many years, their own time service departments, under the supervision of officials employed directly by them, and while the details of their respective regulations differ one from another, and also from those in effect in the States, fundamentally they are the same, the object of such departments, to maintain correct time and safe watches, always being their predominant thought.

As a result of Mr. Ball's investigation, it was clearly demonstrated that not only was it necessary to set standards as to makes and grades of watches employees engaged in the operation of trains should be allowed to carry, but, what was more important, to improve the grades of watches then manufactured for railway purposes in America. At that time very few, if any, American watches were what is known as "lever set," although such type of watch had been developed by the Swiss. Practically all American watches were "pendant set"—i. e., to set the hands you simply pulled up the pendant, whereas, in the "lever set," you are obliged first to pull out the lever and then turn pendant, and it is not possible to close the watch without first putting back the lever; such a safeguard as this would have prevented the wreck on the Pacific coast road previously mentioned, investigation in connection with which developed that the engineer, who carried a "pendant set" watch, had set his watch some hours before, and failed to press down the pendant, resulting in his watch being awry. At the time of the collision he, fortunately, saved his life by jumping, but his watch was one hour wrong.

The best of American watches in those days were only built to a specification calling for fifteen jewels, adjustment to heat and cold, single roller escapement—today, due to the work of the various time service experts, and to the hearty co-operation of the manufacturers, the minimum specification for a new standard watch allowed to be carried by the train crew of any railroad is: 16 or 18 size, 17 jewels, adjusted to five positions, temperature, and isochronism, lever set, double roller escapement, Brequet hair spring, and an extreme range not exceeding 30 seconds per week; and, as an additional factor of safety, it is specified that all watches must have plain Arabic standard dials, open-faced cases, and wind at the figure 12; furthermore, all watch movements must have clearly stamped thereon the name of the manufacturer.

(Generally speaking, the products of about thirteen standard manufacturers comply with these

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specifications, giving employees a choice of between 115 to 120 different grades of watches.)

This clearly indicates, as a result of the inauguration of watch inspection regulations, the tremendous improvement in the standard of watch permitted in railway work, and consequent decrease in hazard.

When a man now enters the service, either as a trainmaster, road foreman of locomotives, supervisor of track, supervisor of bridges and buildings, conductor, engineer, fireman, motorman, train baggageman, brakeman, yard master, yard foreman, and, on some roads, switchmen, before being eligible for duty he must submit his watch to a properly appointed inspector for approval, and have, for the company's records, a certificate duly filled in. If the watch carried is rejected, it is necessary that he immediately provide himself with a watch complying with the minimum standard, or better; further, the man is required thereafter to present his watch once a week on some roads, and once a fortnight on others, to an inspector for comparison with standard time. It is also the rule that all watches must be cleaned, on some roads once every fifteen months, and on others once every eighteen months, and that the men must secure from the watchmaker a loan watch, coming up to the minimum specification, to carry while their own watches are being repaired or cleaned.

Every man coming under watch inspection regulations is called upon to carry a rating card while on duty, which clearly indicates the history of his watch, and as to whether or not he has complied with requirements.

In order to avoid hardship to new men entering service, most companies permit their watch inspectors to sell watches to employees on the instalment plan, the inspectors sending deduction orders to the railway, and the latter protecting the amounts by deductions from monthly payrolls as called for on the order.

In addition to ensuring that men carry correct watches, the railway companies have also undertaken the proper supervision of their own clocks, all offices wherein are located train despatches are equipped with most accurate standard regulator clocks, which are under the constant supervision of the local watch inspector, a rating card, indicating their daily performance, being filled in, and forwarded to the head of the time service department monthly. Similarly, care is exercised to see that reliable timepieces are installed in stations, and that all clocks are kept properly repaired and cleaned.

On all railways standard "time signals" are transmitted over telegraph circuits every morning, these signals being transmitted, usually, from some properly equipped observatory. When such signals are going over the wire, it is prohibited for any telegraph operator to attempt to "break" them. Their receipt has to be subsequently acknowledged by all despatching offices.

Obituary.

WALLIAM R. HOLLIGAN, whose serious illness was reported in the previous issue, died on March 1st at his home in New York. Mr. Holligan was born at Baltimore, Md., in 1856. In 1872 he entered the telegraph service as a messenger in Chicago. He passed through the various grades in the service, including operator, check clerk, division chief, assistant night chief, night chief, wire chief at the main office, and manager at the Board of Trade office, and finally chief operator of the main office in 1899. He remained in the Western Union employ in this position until 1900, when he became city superintendent of the Postal Telegraph-Cable Company, which position he relinquished on June 15, 1901, to engage in the brokerage and bond business in New York City, with which he had been identified until the time of his death. Mr. Holligan is survived by his wife, one son and a daughter, and a sister, Mrs. William J. Lloyd.

THOMAS HENNING, aged seventy-seven years, formerly chief operator of the Western Union Telegraph Company, Buffalo, N. Y., and for many years past engaged in outside business, died on February 25th. Mr. Henning was well known in telegraph circles forty years ago, being one of the leading electricians of his day.

STOCKTON L. GRIFFIN, aged eighty-one years, an old time and United States military telegrapher during the Civil War, died at Veterans' Home, California, on January 24th.

RICHARD PFUND, aged fifty-seven years, an old time telegrapher, but for the past twenty years identified with German radio interests, died in Bellevue Hospital, New York, on February 25th.

EUGENE B. THOMPSON, aged sixty-four years, for many years identified with the Anglo-American Telegraph Company at Harbor Grace, Newfoundland, died on February 9th.

HEISKEEL SHAIN, ticker inspector for the Western Union Telegraph Company, Philadelphia, died on February 25th, at his home at Riverton, N. J.

FRANCIS R. UPTON, aged sixty-nine years, for many years associated with Thomas A. Edison in developing the incandescent lamp and in other inventions, died in Orange, N. J., on March 10th. Mr. Upton was the first president of the Edison Pioneers, and was well known in electrical circles throughout the country.

Radio Station in Poland

A radio station is shortly to be erected in Warsaw, Poland, to make possible direct wireless communication with the United States.

A contract, involving a payment of more than $1,000,000, has been signed by the Polish government and the Radio Corporation of America.

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Telegraph and Telephone Life Insurance Association

The Fifty-fourth Annual Meeting of the Telegraph and Telephone Life Insurance Association took place at 195 Broadway, New York, on March 9th, President James Robb presiding.

Mr. Robb in his report explained what had been accomplished by the association to place it on a firm financial basis during his term of office, which he now proposed to relinquish. He added that the expenses of the association was less than eight per cent. of its income, which was the lowest of any insurance association in the country, so far as he could learn.

In the report of the secretary, it was shown that the mortality had been heavy during the year. It was quite evident, however, that the association was in a good financial condition.

The report showed a full-grade membership of 3,446 on December 31, 1920, and a half-grade membership of 699. During the year there were ninety deaths in full-grade and eight in half-grade.

The treasurer's report showed the total amount of the reserve fund as $337,619.56.

The auditing committee reported excess of assets over liabilities $314,105.72.

E. B. Pillsbury was asked to name a committee to draft resolutions of appreciation of the association on the excellent work accomplished by President Robb.

The officers chosen for the ensuing year were: President, Thomas W. Carroll; first vice-president, Charles P. Bruch; second vice-president, Thomas E. Fleming; secretary, N. M. Giffin; treasurer, George K. Huntington; executive committee —Gardner Irving, E. J. Nally, J. J. Whalen, M. C. Rorty, T. M. Brennan, New York, and F. D. Bermke, Chicago; auditing committee—Charles E. Bagley, Philadelphia, chairman; E. B. Pillsbury and G. W. Fleming New York; advisory board—B. E. Sunny, Chicago; H. J. Pettengill, St. Louis; W. T. Gentry, H. C. Worthen, Atlanta; Edward Reynolds, A. L. Salt and G. W. E. Atkins, New York; J. G. Blake, Chicago; Harvey D. Reynolds, Buffalo, and A. B. Cowan, Denver.

Those present at the meeting besides the officers were: W. C. Merly, William Lennan, A. Carlson, F. E. Fitzgibbons, W. T. Waters, L. Casper, George E. Palmer, S. R. Crowder, B. T. Fleming, W. J. Austin, B. Bernstein, C. F. Egan, George Foran, C. H. Murphy, E. B. Tuthil, J. B. Taltavall, H. W. Dealy, H. E. Roberts, and L. Beall, New York; P. J. Farrell, Boston, and J. E. Dunlap, St. Louis.

Assessments Nos. 693 and 694 have been levied by the Telegraph and Telephone Life Insurance Association, New York, to meet the claims arising from the deaths of Garret S. Mott, White Plains, N. Y.; Charles H. Kintigh, Toledo, Ohio; John J. Balch, Chicago, Ill.; Robert C. Mecredy, Philadelphia; George M. Riggin, St. Joseph, Mo.; Chester B. Melott, Woodhaven, N. Y.; Joseph B. McKeever, Jersey City, N. J., and George R. Shultz, Fort Myers, Fla.

Dot and Dash Club of Philadelphia

The annual meeting of the Dot and Dash Club of Philadelphia was held on March 7th at the Continental Hotel. The attendance was the largest ever recorded at any meeting, thereby indicating increased interest in the affairs of the club. An interesting feature of the evening was the appointment by President Charles E. Bagley of a flower committee, whose duties it will be to visit the sick and cheer with flowers.

Notwithstanding the fact that he is past seventy-nine years, most of which have been spent in the telegraph field, I. D. Maize, affectionately known to the Morse operators as "Johnnie," indulged in many anecdotes, much to the enjoyment of all present. Mr. Maize is today the oldest living telegraph operator in Philadelphia working at the "key," and his Morse is a pleasure to listen to at all times.

Upon motion of A. G. Strickland, the president requested all present to arise and remain standing for a short period, as a mark of respect to our departed members, and a page in the book of records set aside with the names of those who died during the past year.

Colonel J. S. Greene, who is the oldest living telegraph operator, but who is retired, being close to ninety, sent his greetings to the meeting with his autograph appended.

The result of the election was as follows: President, Chas. E. Bagley; vice-president, Andrew S. Weir; 2nd vice-president, George D. Carney; 3rd vice-president, A. G. Strickland; 4th vice-president, Frank E. Maize; secretary, Robert C. Murray; treasurer, James H. Wilson; board of governors—John A. Chapman, chairman; E. C. Boileau, I. D. Maize, A. H. Spracklen, John Wintrup, E. W. Miller, A. G. Wallace, C. F. Myers, Robert Atkinson, Joseph MacIvor, Louis Derrick and Roy L. Massey.

It is proposed to hold the annual dinner in the latter part of April, at which time the newly appointed membership committee hope to present not less than one hundred and fifty names for admission to the club.

Diaphragm Telegraph Sounders

The diaphragm Telegraph Sounders which are advertised in every issue of this publication are continuing to make rapid headway in replacing the old-fashioned sounders, which require local batteries in their operation. Diaphragm telegraph sounders do not need a local battery, and if the relays work the sounders work. Write for particulars, Railways Labor Saving Device Co., 1108 Arlington Ave., Davenport, Iowa.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

J. CONRAD FULLER, government telegraph engineer of the Federated Malay States, South Africa, was a recent New York visitor. Mr. Fuller was in the United States on a trip of inspection.

W. ESTAUGH, of the Construction and Maintenance Company, Ltd., London, sailed from New York on March 1st for home, after completing his work in connection with the laying of the three telephone cables between Cuba and Florida for the American Telephone and Telegraph Company.

A. SIMON, who recently resigned the superintendency of one of the Greater New York districts of the Western Union Telegraph Company to become vice-president of the Credit Guide, was given a dinner by the local managers and officials of his district, and was presented with a gold watch in testimonial of the appreciation of his former associates. The Credit Guide, with which Mr. Simon is now identified, has offices at 415 Broadway. This credit checking company bids fair to become a rival of the Dun and the Bradstreet agencies.

L. C. MCINTOSH has returned to Los Angeles from a visit with Captain E. M. Joyce of the Signal Corps, United States Army, who has fully recovered from his recent illness and is now managing one of the numerous large cattle ranches owned by his father-in-law at Johnson, Arizona.

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POSTAL TELEGRAPH-CABLE COMPANY

This company issued a statement a few days ago through William J. Deegan, secretary, replying to the suit instituted by the Government and Postmaster-General Burleson to recover $2,400,000 of the earnings of the company during the period of government control.

Mr. Deegan's statement, in part, follows:

"Clarence H. Mackay, the president of our system, has authorized me to say that for nearly two years Postmaster-General Burleson and his legal adviser, one Lamar, have had every opportunity to file this suit.

"Now, ten days before leaving office—or, rather, before being put out of office—they bring suit, not in the hope of recovering what they allege is due the government, but merely out of spite and vindictiveness. They bring it at this late day so that they may shirk its prosecution and so put the onus of the prosecution of a weak case on to the new administration.

"Burleson proposed to take $2,400,000 which was earned by our lines, by our investment and by our staff during the year of Federal control, while, on the other hand, he paid to the Bell Telephone and the Western Union Companies $10,000,000 more than they earned.

"Our crime, in Burleson's eyes, was in refusing to allow him to prostitute the wartime control for the purpose of forcing government ownership of the telephones and telegraphs.

"The management of the telephone and telegraph wires by Burleson was most disgraceful, inefficient and scandalous, and cost the taxpayers millions of dollars. Burleson and company have been repudiated the length and breadth of the land. He retires the most discredited cabinet officer in the history of this country."

———o———

Managers Appointed

B. Mildred Curtis, Tiffin, Ohio; H. D. Baggarly, Miami, Fla.; Pauline Smith, Greenville, N. C.; L. Morrison, Bucyrus, Ohio, and Florence Dayton, Wilmerding, Pa.

C. A. COMSTOCK, assistant to the general manager, recently spent several days in Cleveland.

E. P. TULLY, assistant to the general manager, has returned from his recent visit of offices in New England.

F. F. NORTON, of New York, has returned from his visit to the larger operating departments in the western division.

R. GOULD, of the plant department, is making an inspection of the lines and equipment in the South.

C. E. BAGLEY, superintendent, Philadelphia, and P. J. Farrell, chief operator, Boston, Mass., were recent New York visitors.

New York City Notes

MISS H. JENKINS, of 127 Duane Street, has resigned to be married, and will make her home in Philadelphia.

W. J. MOESCH has been assigned as operator to 104 Wall Street temporarily.

MISS BROWN, of 20 West 45th Street, is leaving New York, to make her home in Montreal.

MANAGER KEARSLEY, of 703 Broadway, is recovering from a severe operation.

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MRS. MALONE, our office manager, has been receiving the congratulations from her friends and customers since the opening of the new office in the Emmett Arcade Building.

C. MULLER has been promoted to an operator's position at 14 Desbrosses Street.

THE newly opened office at 1844 Broadway is strictly modern and equipped for growth. There is a gallery in the rear which Manager Di Sylvestro claims is a necessary adjunct to take care of the overflow which will result from his canvassing.

WILLIAM FINLEY, of 944 Broadway, was flooded with congratulations when the stork left a baby girl at his house recently.

MANAGER SHANDLEY is quite proud of his new office at 910 Seventh Avenue.

OUR sympathy is extended to Miss F. O'Day, of the telephone department, in the death of her sister, which occurred last week.

Worcester, Mass.

WILLIAM RYAN, district foreman, and John A. Finn, of Superintendent Kimmey's office, Boston, were recent welcome visitors.

WE READ in the TELEGRAPH AGE that Quad Chief Burke of Boston is a checker "champ." Worcester office hereby challenges "Champ" Burke to a tilt with our Worcester "champ," Night Clerk D'Allesandro, and if he won't do we have two or three more cards up our sleeves.

Boston, Mass.

SARGEANT JOSEPH FOLEY has fully recovered from the effects of an operation for appendicitis, and his many friends are jubilant over his greatly improved physical condition.

WESTERN UNION TELEGRAPH CO.

NEWCOMB CARLTON, president, and L. McKisick, assistant to the president, were Washington, D. C., business visitors last week.

F. A. MOHR, for the past twelve months acting general manager of the Gulf division, Dallas, Tex., has been appointed general manager.

H. R. FRIZZELL has been appointed chief clerk in G. M. Yorke's office, vice C. B. Longsworth, who has been transferred to San Francisco in the capacity of warehouse manager, Pacific division.

Eastern Division

An impressive farewell was extended to Superintendent Allan Woodle by the Buffalo commercial department on Saturday evening, March 5th, at the Hotel Statler, at a dinner which was a splendid testimonial of the esteem in which he is held by his associates in Buffalo. At the same time, C. B. Horton, who succeeds Mr. Woodle as superintendent at Buffalo, was heartily welcomed.

Covers were laid for twenty-seven, twenty of whom were Buffalonians and seven were out-of-town guests, who had been associated with Mr. Woodle at Buffalo and in the old Seventh District. Among them were E. A. Baird, superintendent, Syracuse; J. L. Brady, superintendent, Rochester; W. J. Madden, manager, Lockport; J. W. Cole, Jr., manager, Watertown; A. J. Wesson, Rochester, and William Walsh, Pittsburgh.

After the dinner with a few brief remarks, Manager W. C. Smith, of Buffalo, turned the meeting over to Mr. Baird, who acted as toastmaster for the occasion.

Everybody was given a chance to say something. Most of those present took the opportunity to review some incident of his pleasant association with Mr. Woodle.

A handsome gold fountain pen, the gift of the diners, was presented to Mr. Woodle by Cashier Savage.

Mr. Woodle replied to the speakers with feeling, mentioning his long and pleasant association with the Buffalo force and the regret he felt at leaving, although he is going to a larger field in Pittsburgh.

F. R. WEBB, chief operator at Philadelphia, has returned to his office after a month's absence caused by illness.

New York Western Union

Colonel Ira D. Hough

Colonel Ira D. Hough, whose appointment to the position of assistant division traffic superintendent was recently announced in these columns, is one of the best known officials and telegraph engineers in the United States. His jurisdiction comprises all offices in Greater New York, including the main operating department at 24 Walker Street, which will be his headquarters.

Mr. Hough was born at Plymouth, Mich., on June 4, 1872, where he entered the telegraph service in March, 1887. He has occupied the positions of messenger, operator, railroad agent, train despatcher, associated press operator, wire chief, chief operator, railroad superintendent of telegraph, lieutenant of infantry, captain, major and lieutenant colonel of the Signal Corps, United States Army, as well as filling important positions for various railroads and both telegraph companies.

Notwithstanding his active business career, he is a man of unusual courtesy, and his close acquaintance with the details of the telegraph service in its various branches makes him a valuable assistant to Division Traffic Superintendent S. B. Haig.

MISS ALICE MCMURTRY, who has been absent on account of illness, has returned to duty.

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SAMUEL MOYER has returned from vacation and reports the golf course at Pinehurst in fine condition.

RECENT visitors in the operating room included E. C. Remer and Fred. Jordan, former employees.

ELIZABETH A. FITZPATRICK, aged forty-seven years, a former Western Union operator and sister of M. J. Fitzpatrick, well known in New York telegraph circles, died on March 3rd.

Lake Division

GENERAL MANAGERS T. W. CARROLL, New York, and A. D. Bradley, Omaha, were recent Chicago visitors.

THE various Chicago employees' association locals assembled in the company's auditorium the evening of February 21st to enjoy a well-balanced program of singing, music, movies and addresses of a patriotic and business vein. J. V. Clinin, a Chicago business man, who commanded a regiment which participated largely in the late war, spoke stirringly of his experiences and the lessons to be drawn from the war. Harvey T. Hill, secretary of the Illinois Chamber of Commerce, made a most interesting talk on the business man's problems and the dependency of business on the Western Union telegraph service.

JOHN E. MEANEY, district commercial manager in charge of the main office district, has been quite ill, but is slowly recovering.

THE receiving and delivery office at 123 West Jackson Boulevard, ground floor of our old building, has had its call changed from "CH" to "OB." Its district and work has been reduced considerably, and the large space occupied by it as the main office will soon be cut down and remodeled.

A NEW branch office was recently opened in the Continental and Commercial National Bank Building, 208 South La Salle Street. This is the largest office building in Chicago.

MISS LIBBIE UHLIR, of the general manager's office, whose piano playing added so much to the effectiveness of the program at the dinner given by Local No. 36 at Chicago, is a graduate of the Chicago Academy of Music and continues to pursue her studies there.

JOHN F. MCNICOL, formerly of Indianapolis, has been added to the claim and complaint department force at Chicago.

ABRAHAM NYGOOD, of New York, is now attached to the general manager's office at Chicago. Mr. Nygood is studying medicine during his spare hours.

E. C. ZECH, formerly with the general manager's office, has resigned to go into other business.

THOMAS J. COOPER, aged seventy-seven years, who was manager of the Bay City, Mich., office of this company for forty years, until 1913, when he retired from active service, died at that place on February 28th. He spent his entire life in Michigan. He was one of the first managers to be placed on the pension list of the company.

H. VAN DEVENDER, aged fifty years, division traffic supervisor at Dallas, Texas, died on March 5th. Mr. Van Devender had occupied various positions of importance in many of the Southern cities since 1884. He was chief operator in Atlanta, Mobile and New Orleans at different times.

THE following is a sample of a day's work on the part of Service Clerk Tom Smith in the delivery department, Kansas City, Mo.: Message came to E. M. Knofish, 306 National Bank; we delivered to E. M. Knox, 306 First National Bank Building. Message came addressed to Market Brokerage Company; we delivered to Martin Brokerage Company. Message came addressed to F. J. Kettler, 464 Vagues; we delivered to 4644 Agnes Avenue. Message came addressed to Benson Coal and Grain Company, 410 Avenue; we delivered to 410 Ann. The names did not appear in the city directory, but were simply "doped out" by Mr. Smith.

Cincinnati

NEWCOMB CARLTON, president, accompanied by Vice-President J. C. Willever and other officials, were recent visitors at this office. The presidential party inspected the Dixie Terminal Building, which will house us shortly, and pronounced the structure one of the finest in the country.

A YOUNG lady stenographer in an office building located one block from the nearest Western Union office is firmly convinced that at least one of our messengers is possessed of wings, and probably psychic powers. The young lady had turned the handle of the Western Union call box, and it was still buzzing when Messenger 73 popped his head in the door and said, "Call, please." She was too astounded to say a word, but handed the boy the telegram, and then promptly fainted. Messenger 73 explains it, robbing the story of its supernatural aspect. He had been in the adjoining office and had heard the familiar buzz, and could not resist the temptation to get the message. Sir Oliver Lodge, please note.

MULTIPLEX operation is expected to be inaugurated at Canton and Springfield, Ohio, within the next few weeks, the apparatus for which is now being installed, and a number of students in training at both ends.

THE following changes in managers have recently been made: C. E. Enyart, Steubenville, Ohio, vice C. H. Towns, absent on account of sickness; W. H. Pitzer, at Nelsonville, vice Miss Nellie Benadum, resigned; H. E. Edwards, permanent manager at Kenton.

A NEW independendent office was opened at New London, Ohio, February 1st, in charge of Manager D. A. Reidy, a recent graduate from the manager training school at Niles, Mich.

THE independent office at Orrville, Ohio, was recently turned back to railroad operaiton, and Manager H. E. Edwards transferred to Kenton.

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MESSRS. F. W. LINEAU and F. E. d'HUMY, of New York, were recent visitors at Cincinnati, in connection with the leasing of new quarters for the company's offices in the new Dixie Terminal Building, which it is expected will be ready for occupancy shortly.

A MEETING of the managers of the offices in the southern section of Ohio and the Cincinnati forces was held at Cincinnati recently, at which the land-lines and cable situation was fully discussed by A. C. Kaufman, general commercial agent, of New York; A. C. Cronkhite, general manager, Chicago; L. E. Ragsdale, division commercial manager, Chicago; A. A. Montgomery, district commercial superintendent; City Superintendents Scholl, of Cincinnati, and Grob, of Columbus, and others were present.

A SIMILAR meeting for the benefit of the managers of offices in the northern and eastern sections of Ohio and the Cleveland commercial forces was held at the latter point a few days later.

BOTH meetings were intensely interesting and very instructive, and will no doubt be productive of much good.

Radio Corporation of America

PRESIDENT E. J. NALLY, accompanied by Mrs. Nally and his secretary, returned from Europe on the steamer *Imperator* on March 7th, after an absence of seven weeks, having visited England, France, Belgium and Germany.

DAVID SARNOFF, commercial manager, accompanied by G. Harold Porter, general superintendent of the marine division, and T. M. Stephen, assistant general superintendent, recently visited the high power stations at Marion and Chatham, Mass.

WILLIAM BROWN, assistant to the president, has returned from Washington.

E. F. W. ALEXANDERSON, chief engineer, who accompanied President Nally to England and Germany, is now visiting his parents in Stockholm, and will not return for several weeks.

W. A. WINTERBOTTOM, traffic manager, has completed an inspection of the high power stations on the Pacific coast.

ROY A. WEAGANT, consulting engineer, accompanied by his family, has returned from a brief sojourn in Nassau, B. W. I.

ALEXANDER E. REOCH, assistant chief engineer, recently made a visit of inspection to the New York Radio Central Station on Long Island.

DAVID SARNOFF has purchased a new home at Mount Vernon, N. Y.

Canadian National Telegraphs

GEORGE D. PERRY, general manager; Charles E. Davies, general traffic superintendent, and E. Kenward, superintendent of railway service, Toronto, attended the convention of the American Institute of Electrical Engineers in New York on February 17th.

THE Sixth Annual Conference of the traffic department will be held in Toronto on March 25th and 26th.

A. L. MALLORY, chief operator at Calgary, resumed duties on March 1st, after a three months' leave of absence, during which time he went to England to be married. Hearty congratulations and best wishes are extended to Mr. and Mrs. Mallory.

J. SULLIVAN has been appointed district commercial superintendent at Winnipeg, Man., vice J. F. McTaggart.

R. W. BALL, former manager at Calgary, Alta., has been appointed commercial supervisor at Toronto, vice J. Sullivan.

O. B. HOWARD has been appointed manager at Cochrane, Ontario, vice J. A. Roberge, resigned.

G. R. KERBY has been appointed traveling inspector for the commercial department, Ontario district, vice W. T. Kew, transferred.

THE following appointments are reported by the district plant superintendent at Toronto: W. Girard, supervisor of plant, Montreal; A. Groulx, supervisor of plant, Quebec, and D. A. Mitchell, supervisor of plant, Moncton, N. B.

Old Time Telegraphers and Historical Association

Secretary Thomas E. Fleming, of the Old Time Telegraphers and Historical Association, New York, reports that a great interest is being taken in the forthcoming reunion at Richmond, Va. A block of nineteen applications were recently secured by Mr. Cornelius Christie, of the New York Central Lines, Syracuse, N. Y. Mr. Christie was an old friend and admirer of, and for some years was associated with, the late C. W. Bradley, who was elected president of the Old Timers at its meeting last year in Toronto. The Richmond meeting will be in the nature of a memorial to Mr. Bradley, and to Mr. George W. Stevens, who died shortly after his election to the vice-presidency of the association.

The Associated Press

ROBERT A. BAYLOR, aged thirty-five years, an Associated Press operator at Pawtucket, R. I., died on March 7th at the Government Hospital in Johnson City, Tenn. Mr. Baylor had to give up his telegraph duties on account of illness last January. He had previously been in the Navy Department.

THE Associated Press on March 7th started an automatic circuit from New York to Jersey City, Passaic and Paterson. With Morkrum printers the service is entirely satisfactory.

FRED A. ANDERSON, aged fifty-five years, an Associated Press operator at Toledo, Ohio, died at that place on February 28th.

L. D. STANLEY, of the Associated Press, Indianapolis, Ind., after a service of fifty-two years, has retired.

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Telegraph and Telephone Age

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No. 7 NEW YORK, APRIL 1, 1921 Thirty-ninth Year

CONTENTS

Recent Attainments in Wired Radio. By R. D. Duncan, Jr. (Continued from page 124, March 16th issue) 146
Theory of the One Hundred Line Telephone System. By Harry E. Hershey, of the Automatic Electric Company, Chicago, Illinois 148
Amplifier Enables Doctor to Examine Hearts by Telephone 149
Carrier Current Telephony and Telegraphy. By E. H. Colpitts and O. B. Blackwell (Continued from page 126, March 16th issue) 150
Associated Press Inaugurates a Printing Service. Radio Device Will Guide Ships Safely Through Fog 151
Plain Tales of the Telegraph Line. By Robert Ellis 152
Telephone Hearing. Land Cable Laying by Aeroplane 154
Student's Course in Technical Telegraphy. By Louis Casper. Lesson 24 155
The Future of Radio Telegraphy 157
Editorial—An Inspiration for President Harding. Disposition of the Former German Cables. Dutch Oppose Control of Their Cable to Yap 158
The Railroad—Substituting Message for Telegram. Clocks Regulated by Radio. Put Your House in Order. Direct United States Cable Is Bought by Great Britain 161
Current Events—Personal. Postal Telegraph-Cable Company 162
Western Union Telegraph Company 163
The New Chicago Western Union Office. Messenger Boys Organized .. 164
Shipped Care Western Union. W. R. Williams, City Superintendent, Portland, Oregon 165
The Barbados Western Union Cable. All America Cables. Commercial Cable Company 166
A New Radio Record. Radio Corporation of America. Old Time Telegraphers and Historical Association. Obituary 167
Canadian. Practicing Thrift. Annual Meeting of American Telephone and Telegraph Company 168

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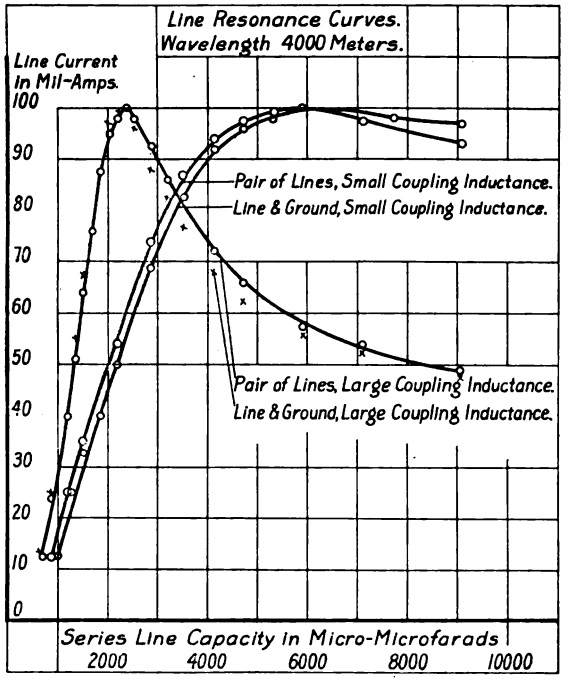
Recent Attainments in Wired Radio

By R. D. DUNCAN, JR.,
Radio Engineer Signal Corps, U. S. Army, in the *Journal* of the Franklin Institute.

(*Continued from page* 124, *March* 16*th issue*)

In low frequency alternating current work where the physical dimensions of the apparatus or circuits are small, in comparison to a quarter wave-length of the fields, the velocity of propagation is properly assumed to be infinitely great. At radio frequencies this assumption may or may not be permissible, depending upon the frequency and physical displacement of circuits. The effect which a finite velocity of propagation has upon the circuit constants has been investigated mathematically by Steinmetz, who has arrived at the conclusion that of the four line constants the resistance was the only one to be affected when the frequency was increased to large values, but did not exceed approximately 1,000,000 cycles per second. Expressions for inductance and capacity of a pair of lines or of one elevated line with ground return, as computed

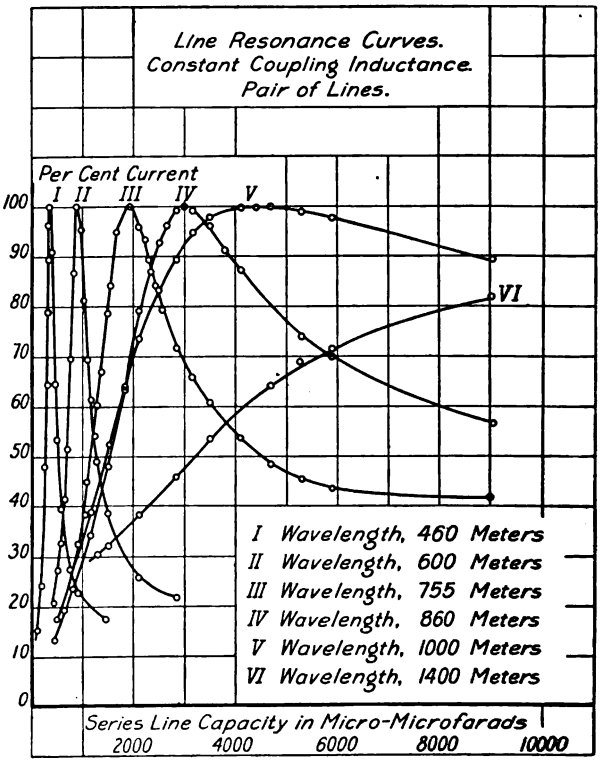
FIG. 12



on a basis of finite propagation (when corrected for skin effect if necessary), were proven to be valid at high frequencies as long as the limit specified was not exceeded. The resistance was found to increase at a rate proportional, among other factors, directly to the spacing between the conductors and to the square of the frequency. For the case of a pair of wires, i. e., a complete metallic circuit, this distance is comparatively small; however, in the case of a single conductor with ground return, the effective spacing between conductors is equal to the distance between the elevated conductor and its electrical image in the earth, or to twice its physical height above the ground. The radiating properties of both distributed systems should become the more pronounced as the frequency becomes higher; those of the wire-ground system should, for a given frequency, be more pronounced than of the two-wire system.

In the derivation of equations (1) to (4), the additional assumption was made that the lines in question were free in space and, consequently, were unaffected by the presence of other lines or by the nearby presence of the ground. These conditions, however, are rarely ever completely realized in practice; the lines used in these particular tests, throughout their entire length, were included on the same pole with other lines, the total number of lines in some locations running as high as one hundred or more.

FIG. 13



As a brief summary it may be stated that, if the accepted transmission line theory does not suffer serious modification when corrected for change of inductance and resistance, and for a possible change of the leakage conductance, about which little is known, for increasing frequency, it is to be expected that the impedance of the lines, measured as functions of the frequency from the generator end, will undergo a periodic variation between maximum and minimum values, as the frequency increases. From a consideration of the theory as outlined briefly above, and from reported observations of measurements on artificial lines, it is to be further expected that the two components of the impedance,

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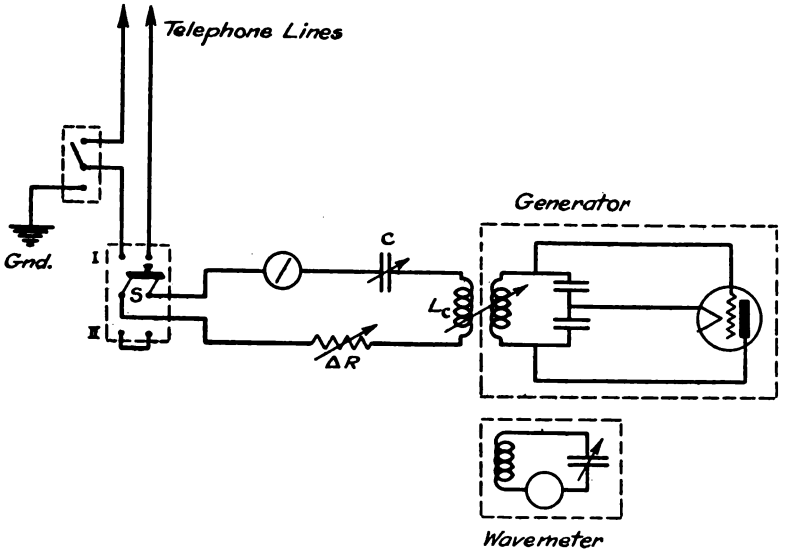
viz., the effective reactance and resistance of the load, will undergo a similar periodic variation, the former passing from positive to negative values, the latter pulsating between the maximum and minimum positive values. In the line measurements described in the following, because of the extremely low potentials applied to the line, it was impossible to accurately measure the impedance as would be computed from observed ratios of the applied voltage to the current input. Instead, the reactance and resistance of the line load were measured separately by the methods later described.

VI. Line Load Measurements

In the adjustment of the transmitting apparatus during the transmission and reception tests, maximum line current was obtained by resonating the load, including both the lines and local circuit, to the operating frequency; this was accomplished by variation of the series line capacity. The tuning features of the line load are illustrated by the curves shown in Figs. 12 and 13. In the former are plotted values of line current against values of series line capacity for both a pair of lines and for one line and ground, for two different values of coupling inductance, but with a constant frequency of 75,000 cycles per second (wave-length 4000 metres); as is to be expected, the tuning is sharper with a large coupling inductance than with a smaller one, the effect in the former case being to "stiffen" the line. The same result is to be accomplished by maintaining a constant value of coupling inductance and varying the wave-length; as shown in Fig. 12, the line tuning becomes broader as the wave-length is increased. The ordinates of the curves in this figure were computed on the basis of assigning a value of 100 per cent. to the observed maximum values of each curve and computing the values of the other points as a percentage of 100.

The reactance and resistance measurements were also based upon the phenomena of resonance. Referring to Fig. 14, wherein is shown the circuit employed during measurement, it will be observed that the line load in series with a variable capacity C and resistance vR, is inductively coupled to the radio frequency current generator through the inductance Lc. With the resistance vR, set to zero, and with the switch S in position I, the capacity C is varied until the entire load, including both the lines and local circuit, is in resonance, as indicated by a maximum reading of the line ammeter. In this condition the reactance of the capacity C exactly neutralizes the combined reactance of the inductance Lc and of the lines; readings of the series capacity and frequency are noted. Switch S is then thrown into position II, which in effect short-circuits the lines so far as the generator is concerned; maintaining the frequency the same as before, the series capacity is again varied until resonance is obtained and a second value noted. The algebraic difference in values of the reactance of the series capacity for the two settings gives the sign and magnitude of line reactance. The line resistance was measured by the "half-deflection" method.

FIG. 14



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(To be continued)

New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

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Theory of the One Hundred Line Telephone System

By HARRY E. HERSHEY
Of the Automatic Electric Company, Chicago

Machine switching, as applied to the operation of telephone switchboards, is today without doubt the foremost subject under discussion wherever telephone engineers are gathered together. For this reason TELEGRAPH AND TELEPHONE AGE takes pleasure in presenting to its readers a series of articles by Harry E. Hershey of the Automatic Electric Company, Chicago, dealing with this important subject.

The telephone was invented in 1876 and exhibited at the Centennial Exhibition at Philadelphia. Connally and McTighes, the pioneers in automatic telephone development, applied for their first patent in 1879. The Strowger Automatic System originated about ten years later, and their first patent was applied for in 1889. The first commercial installation was that at LaPorte, Ind., in 1893. Since that time Strowger automatic installations have steadily increased, as the exchanges in operation have "proved in" as regarding maintenance costs and service rendered.

The increasing difficulty experienced in obtaining labor during the past dozen years was the direct cause of many automatic exchanges. The world war still further increased labor costs, and thus was the deciding factor which led the largest operating companies in America to publicly adopt automatic under the name "Machine Switching, Step-by-Step Method."

Mr. Hershey, in his series of articles, will discuss the theory of trunking, the mechanics of the apparatus, and the controlling circuits commonly used in automatic. The subject will be developed from a One-Hundred-Line System through the various stages until a multi-office system of unlimited size is reached. The theory, mechanics, and circuits relating to each stage are presented in such a manner that the reader will have no difficulty in obtaining a general knowledge of the art, even though he may not have had the opportunity of seeing an automatic switchboard in operation.—EDITOR'S NOTE.)

In order to reduce the subject of automatic telephony to such a form as can be readily understood, we will limit ourselves to a discussion of a one hundred line system. Imagine, if you will, one hundred telephones scattered around the city, each telephone being connected with the Central Office by two wires. The first question that confronts us is the arranging of the terminals of these wires in some systematic manner. By referring to Fig. 1 it will be seen that we have provided what is termed a line bank, which consists of one hundred sets of double contacts. These double contacts are placed in rows, ten wide and ten high. The two wires from each telephone are connected to the pair of contacts corresponding to the number of that particular telephone.

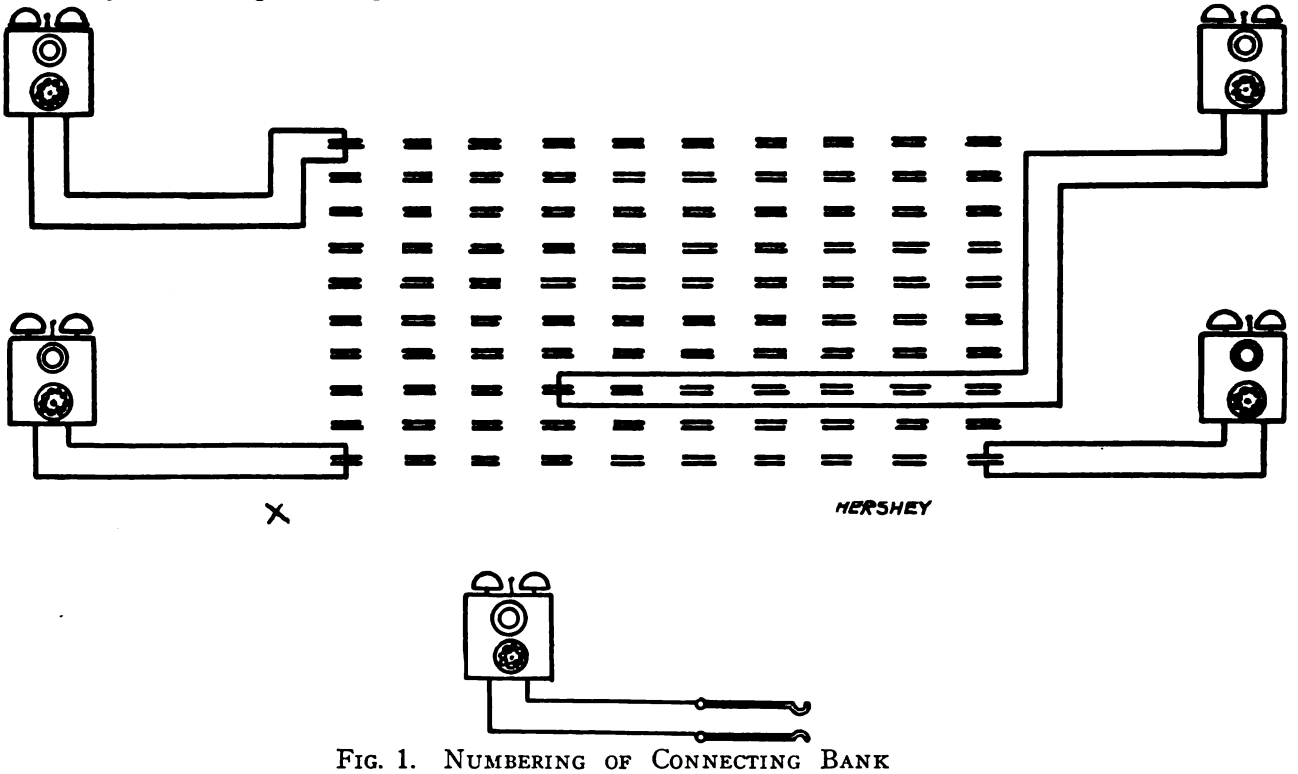

FIG. 1. NUMBERING OF CONNECTING BANK

NUMBERING SCHEME USED IN AUTOMATIC

This brings us to a consideration of the system of numbering used in an automatic switchboard.

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At first though you will probably conclude that the original designer was endeavoring to find the most complicated numbering system possible. But after becoming acquainted with its peculiarities you will begin to see the simplicity of the arrangement. Assume that we are standing just below the lower left-hand corner of the rectangle, at the point X. If we take one step up and one step to the right we are connected with a telephone whose number is 11. From the same position as before, if we take three steps up and four steps to the right, we are connected with telephone number 34. Thus it will be seen that the number of any telephone may be found by noting the number of steps up (vertical steps) and the number of steps to the right (rotary steps) necessary to reach its terminals. Thus 1 vertical step and 0 rotary steps gives us telephone number 10, since in automatic practice 0 always means 10. Again, 0 vertical steps and 1 rotary step gives us telephone number 01.

Functions of the Connector Switch

Since we have obtained an idea of the arrangement of the terminals in the office we will now discuss the means by which a subscriber can use his telephone to be connected with any other telephone. Since this is an automatic exchange, it has no operators, so it is necessary to provide a mechanical and electrical mechanism which may be controlled by the subscriber in such a manner as to accomplish the following results, which are usually spoken of as the functions of the Connector Switch:

A. *Reach the called line.*—Means by which the wires from the calling telephone may be moved up and in, to make contact with any desired telephone.

B. *Test the called line to see if it is busy.*—This must be done without disturbing the subscribers who are using the line, should it be in a busy condition. If the called line is busy the machine must advise the calling subscriber of the fact, and must prohibit the subscriber from calling another number until after he has released the present connection.

C. *Protect the called line from intrusion.*—That is, it must arrange matters so that should a second party attempt to call this line he would find it in a busy condition.

D. *Clear the called line of attachments.*—Which means to disconnect the mechanism which is normally attached to the called line.

E. *Signal the called subscriber.*—The ringing is to be done intermittently until the subscriber answers, or the calling party releases. When the called party answers, the ringing must cease without annoying the called subscriber.

F. *Feed talking battery to the calling and called subscribers.*—The mechanism must furthermore provide what is termed supervision, in case the call originated at a toll board.

G. *Release of the connection.*—The machine must provide means by which the restoration of the receiver to the switch hook at the calling telephone will release the mechanism and place it in readiness to make another call.

Questions

A. In Fig. 1 point out the terminals of the following telephones: 19, 81, 23, 99, 50, 12 and 00.

B. In a one hundred line system how many line banks would you expect to find?

C. What is meant by the term, "individual connector"?

Amplifier Enables Doctor to Examine Hearts by Telephone

An amplifying device described as so delicate as to permit a physician in one city to make a stethoscopic study of the heart action of a patient hundreds of miles away, was demonstrated to a group of army and civilian medical men at the Army Signal Corps laboratories in Washington, D. C., on March 12th. The principle involved is similar to that used in transmitting President Harding's inaugural address to the great crowd that extended far beyond the ordinary reach of the human voice.

The demonstration was directed by Major-General George O. Squier, chief signal officer. The stethoscopic apparatus with electrical connection was placed over the heart of one of the laboratory assistants, and the heartbeat was amplified many thousands of times, emerging through a phonograph horn to be heard distinctly and studied by the physicians in a room some distance from that in which the subject was located.

The device may be used in connection with any telephone wires, and will function as far as the telephone wires will transmit the voice in ordinary conversation.

"A special heart transmitter has been designed which rests by its own weight over the patient's heart," said General Squier, in describing the apparatus. "The passage of the blood through the different valves of the heart causes vibrations in an air chamber, which faithfully reproduces all of the various actions. These are transmitted over the wire to an amplifying apparatus attached to a large horn, which projects the sounds throughout the hall."

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by Telegraph and Telephone Age, 253 Broadway, New York.

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Carrier Current Telephony and Telegraphy

By E. H. Colpitts and O. B. Blackwell.

(*Continued in part from page* 126, *March* 16*th Issue*)

Development and Operation of Commercial Carrier Systems. In 1914, simple forms of carrier circuits, embodying the fundamentals of our present system, were successfully set up in the laboratory, and experiments carried out with them. In view of the favorable conditions which had resulted from the various developments noted, it was decided to begin active work toward commercial carrier systems. Field measuring apparatus was developed with which the characteristics of existing telephone lines were carefully studied in the carrier-frequency range. At the same time in the laboratory the physical possibilities and limitations of the various types of apparatus and circuits were being studied. Based on these fundamental data there was developed in the laboratory a complete multiplex telephone system providing two-way telephone conversations, and operating over an artificial line. This laboratory apparatus was then taken into the field and tried out on a line between South Bend, Ind., and Toledo, Ohio. The practical difficulties always encountered were overcome, and satisfactory operation secured. At the same time satisfactory results were obtained on a simple type of carrier telegraph system between Chicago and Toledo.

The entry of this country into the war brought the work to a standstill for a time. However, the same cause created a demand for more telephone circuits between Washington and Pittsburgh. It was decided to meet this demand by a trial installation of a carrier telephone system between Pittsburgh and Baltimore, from which point cable circuits to Washington were available. In view of the urgency of the situation, the apparatus used in the earlier field experiments was adapted to equip the Pittsburgh terminal, while new apparatus was built for the Baltimore terminal. This carrier system went into service and has since been operating satisfactorily.

Principles of Operation

General. An adequate understanding of carrier systems requires a consideration in some detail of the fundamental principles underlying their operation. Some of these principles, which are also important in connection with telephone repeater operation and in connection with radio telephony, have already been discussed at some length. Emphasis will, therefore, be placed on those features which pertain more strictly to carrier operation.

The underlying principles of carrier will be described in their application to carrier telephony. Their application to the somewhat different conditions of carrier telegraphy will be treated separately in a later section.

We will first discuss those features which are involved in a single one-way carrier telephone transmission channel, including generation of carrier current, modulation and demodulation of detection. Next will be considered multiplex operation in a single direction, involving separation of channels by selective circuits, followed by a consideration of two-way operation of single and multiplex channels. Next will be presented an explanation of another type of system in which no unmodulated carrier current is transmitted over the line and of a special mode of carrier current generation particularly adapted to this system. Finally, the repeaters used for amplifying the currents of carrier frequency at intermediate points, and certain other matters, such as ringing and the assignment of carrier frequencies will be discussed.

The operation of oscillator circuits in their many forms has been so thoroughly covered in recent technical literature as not to require detailed discussion here.

Modulation. The process by which the carrier current produced by the oscillator is so combined with the voice currents from the telephone transmitter, that the variations of the latter are impressed upon the former, is known as "modulation," and the tube circuit in which this is accomplished is known as the "modulator."

It will be noted that the potentials of carrier and voice frequencies are applied in series in the grid circuit of the modulating tube together with a steady voltage from a battery. Owing to the non-linear relation, which exists between the plate current and grid-voltage, the output current of the tube is not simply a reproduction of the alternating voltages applied to the grid. In fact, the modulating properties of the tube result from the interactions between applied voltages which this non-linear relation introduces.

It is evident that while the output current includes both the modulating current (here a sinusoid) and the carrier current, the amplitude of the latter varies in accordance with the instantaneous value of the former. Hence, even though the relatively low modulating frequency itself be removed by a selective circuit, its variations are preserved in the wave form of the higher carrier frequency.

As it is not at once obvious from an inspection of this modulated carrier wave what must be the frequency characteristics of a circuit which is to transmit it to a distant station, it seems worth while at this point to consider what component frequencies are present in the carrier wave and which of these are essential. The case is exactly analogous to that of attempting to design circuits for ordinary telephone transmission from a consideration of an oscillogram of a voice wave rather than from an analysis of its frequency characteristics. In the case of ordinary telephony, the problem has been solved by analyzing the voice wave into its component of various frequencies and ascertaining which of these frequencies it is essential to preserve and which may safely be neglected. This analysis has been accomplished largely in an experimental way through the use of electrical circuits selective to particular ranges of frequency. As a

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result of these experiments, it has been determined that speech of satisfactory commercial quality may be secured if the circuit is capable of transmitting all sustained alternating currents whose frequencies lie, let us say, between 200 and 2000 cycles per second. These limits having been determined, the apparatus may then be designed on the basis of its meeting these requirements as to the transmission of sustained single frequencies. The information accumulated at voice frequencies can be applied directly to the solution of the carrier current problem and, incidentally, to radio telephony, provided we know what component frequencies are present in the modulated carrier wave and what relations exist between these components and the component frequencies of the modulating or voice wave. For a complete discussion of the analysis of a modulated wave into its component frequencies, reference may be made to a publication by Carson; and for its application to vacuum tube operation to Van der Bijl. While it is known that a modulated wave can be resolved into a large number of component frequencies, it is necessary to consider here only those components which are directly involved in carrier transmission.

From this it follows that every component frequency of a modulating voice wave is represented in the corresponding modulated carrier wave by two components, one of which is greater in frequency than the carrier wave by the frequency of the voice component, and the other of which is less by the same amount. We may, therefore, be certain that all of the essential components of the voice wave will be preserved if those components of the modulated wave are transmitted whose frequencies lie within two frequency bands, one of which extends from the carrier frequency plus 200 upward to the carrier frequency plus 2000, and the other from the carrier frequency minus 200 down to the carrier frequency minus 2000. These are known as the upper and lower side bands, respectively.

While the above discussion refers more specifically to the use of the vacuum tube as the means for effecting modulation of a carrier current, it should be understood that any device possessing a non-linear current-voltage characteristic will operate more or less effectively as a modulator.

(*To be continued*)

Associated Press Inaugurates a Printing Service

The Associated Press has inaugurated an automatic printer service between New York and Boston, with a speed of sixty to eighty words per minute. The printer is manufactured by the Kleinschmidt Electric Company of New York, and its system of transmission is similar to that used by the Morkrum and American Telephone and Telegraph machines.

It is in the method of receiving the signals that it differs. The machines on the line which have been in operation heretofore used what is called a typewheel in printing the letters on the paper, whereas the new machine prints the letters in exactly the same manner as a typewriter.

As you watch the receiving machine grind out the copy, the thing which appears most striking is the evenness and the speed with which the typebars move up and down, with no more noise than an ordinary typewriter.

The manufacturing company claims that the typebar construction of the printer lends itself more readily to high speed operation than the other types of machine, and that its printer is merely an electrically operated, ruggedly constructed typewriting machine capable of all ordinary typewriter operations, including the making of carbon copies. It is further stated that the speed of operation can be increased to eighty words per minute on good lines, and the average for all sorts and conditions of lines should be sixty to seventy words per minute. Under the same line conditions, the system is said to have inherently higher speed, due to the fact that it operates at lower line frequency per letter than other printer systems.

The machines have been in operation for several years, but have not been available to anyone other than the Western Union Telegraph Company until now, when the first opportunity to test their capabilities on press association work is given to the Associated Press.

These machines are working on both the day and night wire to Boston, through a set of repeaters at Hartford, and at the present time the report is being transmitted at the rate of sixty words per minute. It is planned to increase this speed later on when the operators who are maintaining the machines become thoroughly familiar with their mechanism.

In addition to sending and receiving machines at New York and Boston, printers are in operation at New Haven, Hartford, Springfield, Worcester and Providence. Altogether fourteen machines are working on this line, day and night, exclusive of the emergency machines which are available in the event of the working machine failing properly to function.

Radio Device Will Guide Ships Safely Through Fog

A new wireless invention by which ships may be guided during dense fogs is announced. The invention is based on a principle by which electric waves may be directed in any definite direction like flashes from a lighthouse. These waves would take the place of leading lights in thick weather, and would prevent collisions of vessels during fogs.

The simple apparatus that made this feat possible consisted of a pair of coils, one on either bow of the vessel, and connected to a vacuum-tube amplifier, which picked up the magnetic field created around a submarine cable energized by a low-frequency alternating current. This submarine cable is laid in the center of the channel and in a permanent position.

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Plain Tales of the Telegraph Line

When O'Toole Slipped Up With the Shovels

By Robert Ellis

As the gullible bogtrotter from the Emerald Isle stepped off the gangplank of the old *Baltic* of the White Star Line at Ellis Island, he was greeted by an officious, arrogant guard in blue habiliment, who peremptorily demanded the greenhorn's name. "Me name you want?" he inquired, good humoredly, then stopped right there. Thinking it best to placate his inquisitor, whose feelings were becoming ruffled by his extraordinary behavior, he piped again, "Sure, it's Tim O'Toole from Tipperary, if you want to know that, too."

Blessed with a colorful brogue and a physique above the general average that had gained him prowess in the bog country, O'Toole went out of the Barge Office looking for a man's job.

A general business depression and, atop of that unwelcome condition, a widespread strike among the longshoremen at the time of Tim's arrival, prevented him from securing a job in any capacity, and in a short time he had been stripped of his last shilling. Then work of any kind and anywhere was imperative. Six months later, thanks to the leniency of brakemen on the various railroads, we find him part and parcel of Bud Anderson's Western Union line construction crew, working out of Salt Lake on the Western Pacific road. Though raised in circumscribed surroundings where golden opportunities never presented themselves, he was now inoculated with the American spirit which imbued him with a sincere desire to get on further, and it was not long before the ruddy-faced Irish lad had quit digging pole holes and was qualified to use the hooks. He had become a proficient climber in this remarkably short time, so diligently had he persevered in learning the knack of climbing timber, and had familiarized himself thoroughly with the intricate work performed by linemen in the telegraph service. When the work was completed and the gang disbanded, Anderson, who had taken a fancy to young O'Toole, endeavored to place him as a station lineman at Salt Lake, but the wanderlust fever was so strong in his veins, he would have none of it. He disdained the humdrum existence of isolating himself at a station and forthwith he became a floating traveling lineman. In time the fame of Tipperary Tim was known from the Chicago River to the Pacific slope.

In the spring of the year 1905, a good many years after he came to this country, Tim returned East, but vastly changed in appearance, and was hardly recognizable as the towering Irishman who got the guard's goat at Ellis Island a few years previously. It appeared that in one of the many climbing stunts he performed West which made him notorious, the inevitable happened; he cut out in descending a 50-foot stick, and it was many weeks before he was able to leave the hospital. He came out a broken man both in spirit and in body. With a feigned intrepid front but flagging steps he slightly limped into General Foreman Plunkitt's stuffy tool and wire heaped office at 195 Broadway, New York, and in a tremulous voice which he tried hard to suppress, asked the spectacled, red-faced Plunkitt for a job. Slung carelessly across his drooping back dangled a pair of climbing hooks dulled as only age could dull them, the only indication which marked him as a former liner. Fortunately for the crippled O'Toole, he could not have applied for a job at a more propitious moment, as Pat Mulligan's rough and readys were now awkwardly selecting an assortment of heavy tools and material which lay in an indiscriminate pile on the floor, and were about to break away. Mulligan, who was present at the short but successful termination of the interview between Plunkitt and O'Toole, realizing that he was short of just one grunt, asked Plunkitt's permission to take him on. Feeling compassion for O'Toole, Plunkitt readily acceded to Mulligan's request, and, with a curt dismissal, Plunkitt returned to perusing his voluminous plant correspondence. "You grab hold of them banjos, O'Toole, and come along," he barked out, as he elbowed his way ahead of the men out into the street. Elated at his luck in landing a job so quickly, O'Toole became for a moment rejuvenated and instantly pounced upon a bundle of shovels as if afraid they would get away from him. Mulligan had a rush job on hand that morning. He was to set forth to Scarsdale, N. Y., a town on the Harlem Division of the New York Central, where the telegraph company maintained a very heavy line. Due to certain railroad improvements which were to be made promptly, a part of this line was to be trenched back for quite a distance, and which work included several of the larger poles. It was obvious from the nature of the work, short-handle shovels or "D" shovels would not come amiss on this job. In fact, they were indispensable, and it was these precious tools the grunt O'Toole was entrusted with, and which Mulligan would find it convenient to have when he commenced the Scarsdale job. Scarsdale was a growing town and geting on the map fast, for even at the early hour when Mulligan's husky gang stepped off the accommodation the long platform swarmed with people rushing to their daily toil. It was largely due to the assistance of the obliging baggageman on the train that steel bars, tampers, peavies, blocking tackle and other telegraph material were got out in time before the train pulled out for White Plains, for the gang had quite a carload to unload in the short time allotted them.

The long line of high sticks and the heavy stretch of wires topping them looked formidable to Foreman Mulligan, and Slavin, the Straw Boss, as they sized up the job they had to do. "Quite a few poles to be trenched over, eh, Pete?" Mulligan remarked. "It's a lucky thing we brought them short shovels out," he augmented, as he and his assistant retraced their steps to their charges, who were at ease at the freight house. "Here, fellows, get on the job; don't spare them shovels, but keep digging," this time he yelped at the boys as they clawed for shovels in the mass of tools and mate-

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rial blocking the freight door. At the same time when this hunt for the shovels was in progress, the climbers were adjusting their spurs and body belts preparatory to ascending the poles to untie the wires, and as subsequent developments did not interfere with their work, they were soon at home on the crosstrees. Much to the astonishment of the gaping open-eyed grunts, they could find no trace of a shovel. Tools galore lay at their heavy-shod feet; all except the homely shovel. Exasperated by the delay of his men in getting started, Slavin, bellowing with rage, fairly cursed them for their seeming tardiness. "Not a smell of a shovel to dig with," exultantly sniggered one of the crew, but he had kept at a discreet distance from the Straw Boss, nevertheless. "Where in darnation are they?" demanded Slavin, as he cast suspicious eyes on the members of his crew. Ignorant of the whereabouts of the shovels and, furthermore, which they considered was not their concern, they should worry, they kept silent and ignored his peppery question. "Who had charge of them, you deaf mutts?" he went on, with added vehemence. In order to relieve the tension and placate the angry Slavin, a subdued voice from the rear of the blue-shirted crowd piped out, "I think you will find that your new man, O'Toole, knows about those shovels." O'Toole, who had also been discreetly keeping in the background all the time, feeling himself guilty, as he was not dead sure whether he threw out the shovels or not, meekly lied out to the big assistant, "So help me, God, I took them shovels out and left them on the platform." He conceived what the consequences would be if the foreman was cognizant of the fact that he had neglected to take them out of the car at their abrupt departure from the train at Scarsdale station. Slavin's acquaintance with O'Toole being necessarily short, he could but give credence to his story, and reluctantly attributed the loss of the shovels to theft. "Well, they are gone, but not forgotten, you bet," he dronefully retorted, directing his gaze at O'Toole. Disconcerted by their loss, he spoke once more earnestly, "We can't do this work without shovels. Say, O'Toole, I don't know whether you are guilty or not, but for heaven's sake borrow six shovels and be darn quick about it. Don't come back without them," he added threateningly as he joined his foreman, who was now approaching.

Nothing loath to be relieved from a further lecture on the subject of shovels, O'Toole was glad to get away, and hobbled up the tracks to borrow the diggers. As short shovels were vital on this excavation work, little could be accomplished on the ground without them, and the six grunts remained practically and blissfully idle. Tim O'Toole would be back in a few minutes, opined both Mulligan and Slavin, as the section shanty where he might obtain the shovels was only a short distance up the tracks. The morning flittered all too quickly, and O'Toole and the "D" shovels were still marked absent.

While this chaotic condition of affairs at the Scarsdale yards were putting a crimp into the pay-rolls of the Western Union, O'Toole was by no means idle. Blunt refusal on the part of the dark-skinned repellant-looking custodian at the section house, indicated by Mulligan, to loan him a few shovels, despite his credentials, discouraged him not a little, but a shovel he must have or O'Toole would once more find himself on the breadline or hie himself over the hill to the poorhouse. Fearful of this calamitous happening, he plugged on stubbornly up the ballasted roadbed. His dogged persistence was amply rewarded at Hartsdale, for was not Duffy, the section boss, an Irishman, too? It was not long before O'Toole was toting to the waiting gang at Scarsdale six brand new short-handled shovels, but, alas! there was a slip between Hartsdale and Scarsdale. O'Toole did the slipping and we later find him with his borrowed tools on the southbound afternoon train, where Mulligan finally located him, as this sequel will show.

To suppress their growing ire, Mulligan and Slavin paced up and down the tracks in heated conversation, while the grunts, every ready to get a respite of this kind, rather enjoyed their superiors' discomfiture and their non-occupation. The climbers, however, were busy aloft. Despairing of O'Toole's return, Mulligan handed Slavin a roll of bills. "Say, Slavin," he declared suddenly in the hearing of the men, "there is no sign of that Turk coming back with the shovels; go buy a half-dozen and get these grinning fools to work." O'Toole, the fool, as Slavin aptly termed him, was still an absentee in the afternoon, as the gang, provided with brand new shovels, were speeding up to make up the delay of the morning layoff, and they were smarting under sore backs, too, as Mulligan and Slavin, in a rancorous mood, were driving them as they had never been driven before.

"You blame idiot, you big Mick, you ———! Where in creation were you?" They heard Mulligan's roaring voice clear in the baggage car, where they had proceeded to on the homeward train that evening. Recognizing their superior's stentorian voice and suspecting that he had come across the missing O'Toole, they strode out in a body to the smoking car. The object of the foreman's wrath and their curiosity lay prone in a forward seat, a helpless victim of conviviality and oblivious of the mouthy cannonading of the fiery boss. Getting no response, in fact not expecting any in his condition, Mulligan finally desisted, and his eyes traveled to the feet of O'Toole between the seats. One glance was enough. "Ye Gods!" he ejaculated, wringing his hands, "the shovels!" It would seem that O'Toole had carried out part of his orders at least; he had the borrowed shovels.

The gang, satisfied with the comedy in the smoking car, filed back into the baggage car, where their mud be-smirched tools lay. Mulligan had just about seated himself and was in the act of lighting up his cigar when Slavin rushed in, laughingly, and tapped him on the shoulder. "Hey, Mart," he called out, familiarly, "what do you think? We

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found the shovels O'Toole took out of 195. They never left the baggage car at all. This is the same car we went up in this morning."

Aside from the painful prospect of firing O'Toole in the morning, Mulligan was in jubilant spirits, as he mentally pictured how the old storehouse at Jamaica would look with the additional twelve short-handled shovels stacked up alongside of the other truck in that little storehouse.

Telephone Hearing

Earl C. Hanson, of Washington, D. C., has recently been granted patents covering an electrical apparatus to aid deaf persons in hearing. Mr. Hanson has this to say regarding his device:

"The problem of developing an electrical instrument that will be an aid to the partially deaf, as glasses aid those whose vision is defective, has engaged the attention of some of the world's greatest scientists and physicians.

"Considerable progress has been made in the development of telephonic hearing aids for the deaf, but due to the inherent limitations of the telephone transmitter and receiver, development along this line had apparently reached its limit when what is nowadays known as the "vacuum tube amplifier" opened a new field for research and development. Due to the fact that it is a distortionless amplifier of minute electrical impulses, it is adaptable for use in an electric circuit between telephone transmitter and receiver. In other words, it conveys and reproduces human speech more clearly and loudly than any electrical hearing aid so far produced.

"Too much credit cannot be given to the scientists and engineers who by their untiring efforts have developed the vacuum tube to its present perfection. This device has been one of the greatest factors in making transoceanic wireless signaling possible and in solving the problem of long-distance line wire telephony and of wireless telephony.

"The research engineers of the Western Electric Company and the Government Laboratories have brought the amplifier to its present state of perfection through extremely costly experiments extending over a period of years.

"The vacuum tube hearing aid, like many other inventions, is the result of the work of many inventors. Bell invented the telephone; Blake, Edison and Berliner improved the telephone transmitter; Fleming improved Edison's early discovery of the two-electrode vacuum tube which grew out of the incandescent lamp; and DeForest inserted the third electrode in the Edison-Fleming tube and thereby gave to the world its most sensitive electrical device. The amplifier magnifies the speech vibration striking the transmitter-diaphragm when the speaker is at a distance from the device, and in this way makes it possible for the deaf to hear conversation which they could not hear before.

"Tests made with persons hard of hearing have proved that, although they are now able to hear with the Vacuum Tube Amplifier, due to the increased volume, which can be varied at the will of the user, and also because the speech is clearer. These experiments have also shown the desirability of using transmitters of various types and sensitiveness to better suit the particular type of deafness to be aided.

"One of the great difficulties encountered heretofore has been that in the effort to obtain volume the transmitter was overloaded, and thus caused a roaring or undertone in the receiver.. Telephone engineers and those familiar with the characteristics of the vacuum tube agree that it amplifies feeble currents without distortion. This permits the use of a telephone transmitter without overloading and thereby retains the clear speech received over line wire telephony. People with normal hearing, and even those who hear poorly, hear distinctly on the standard wire telephone. A great many people afflicted with deafness use the telephone satisfactorily, even though they have difficulty in distinguishing ordinary conversation. This apparatus is designed to use the common commercial type of dry battery. The volume of speech is governed at the will of the operator by regulating a control-switch.

"This vacuum tube hearing aid, which I have named the 'Vactuphone,' bridges this chasm and gives people who are hard of hearing even better results than they have obtained heretofore over the ordinary telephone.

"I wish to express here my deep gratitude to the Volta Bureau of Washington, D. C., endowed by Dr. Alexander Graham Bell, for the use of the Bureau's reference library and Dr. Bell's laboratory in making my tests. This splendid institution is engaged in research work to prevent deafness and to aid those who are hard of hearing, purely as a philanthropic work, and it cannot be too highly praised for the encouragement and assistance it renders to those conducting investigations along this line."

Land Cable Laying by Aeroplane

A six-mile stretch of land telegraph cables was laid and put into service in eight minutes by a plane that came from its station forty miles away in Sweden recently. Of the eight minutes, six were spent in flight and the other two in making connections.

Great possibilities, both military and commercial, are seen by air service officers in this new enterprise. Equipment of planes for cable laying is simple and inexpensive.

The cable is unreeled from the machine in flight with a flag marker at the end to guide signalmen on the ground to it.

When over the point at the other end of the stretch of ground to be covered, the wire is cut from the reel and the free end weighted, marked and dropped. The men below merely have to pick it up and connect it to begin talking with the forces at the other end.

A SUBSCRIBER writes: "Please change my address from Blank to Blank. I find it is much cheaper to move than to pay rent."

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Student's Course in Technical Telegraphy

By Louis Casper.

Lesson 24

In this, the concluding article on wire testing, it is deemed desirable that the student should familiarize himself with certain simple formulae (in addition to those already given in former lessons) which find a wide application in some of the principles involved in the practice of fault finding.

Let us first consider the case of a special adaptation of the Murray Loop test known, after its inventor, as the H. W. Fisher method.

This method can always be applied when there are two good conductors whose respective ends terminate at the same point as those of the faulty conductor.

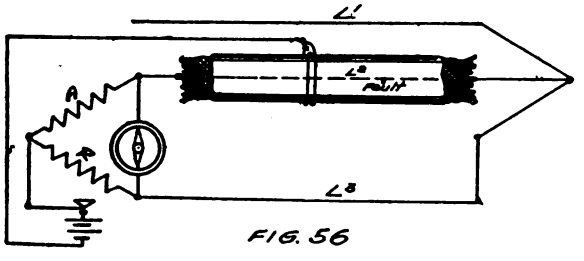

FIG. 56

The resistance of all three wires can differ without affecting the test. For that reason, this method has a peculiar adaptability in cases where it is desired to use aerial wires in conjunction with conductors of the cable for localizing a fault in the latter.

In Fig. 56, which comprises the first test, all the conductors are shown connected at the far end of the cable. The battery is grounded at the cable sheath through an interrupting key as shown. The faulty conductor in the cable is connected to bridge

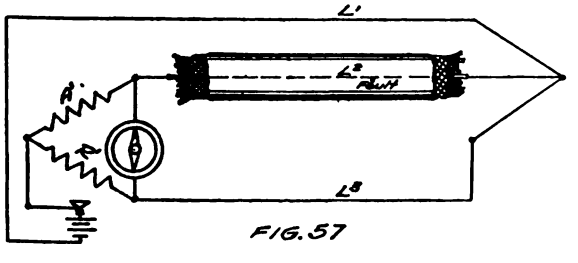

FIG. 57

arm A and the wire L^2 to the arm R. The line L^1 is left open in this test.

The resistance R is varied until the galvanometer is unaffected by the closing of the interrupting key.

The second test is shown in Fig. 57. In this test the battery is attached to the wire L^1, and the value of R^1 is then obtained in the manner just described.

After ascertaining the values of A and R in the first measurement (Fig. 56) and A^1 and R^1 in the second measurement (Fig. 57), and, assuming (as heretofore) that L equals the actual length of the faulty conductor, then the distance to the fault =

$$\frac{A\ (A^1 + R^1)}{A^1\ (A + R)} \times L$$

This method can be applied to the location of a cross, but in that case one side of the battery must be connected to the wire crossed with the one used in the test, instead of with the cable sheath, as shown in Fig. 56.

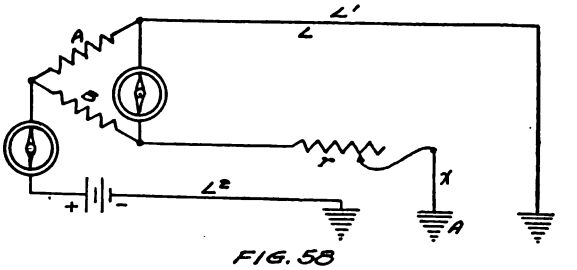

FIG. 58

Pomeroy's Method of Testing the Resistance of Grounds

It is frequently desirable to obtain the resistance of a ground connection. In the tests shown in Figs. 58 and 59 two lines are shown connected to independent grounds.

It is necessary in this test that the value of the current should be approximately the same in both cases, and the battery required for the second test should, therefore, be increased accordingly. In order to best ascertain this increase, a galvanometer or other detector is inserted in series with the battery as shown. The battery connections are reversed in the second test, so that the direction of the current from the ground A may be the same in both cases. Now, assuming, that L includes the resistance of the ground upon line L^1, then—

1st test $A\ (r + x) = BL$

2nd test $AR = B\ (L + X)$

and $X = \dfrac{A\ (R - r)}{A + B}$

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Or, when the arms A and B are equal—

$$X = \frac{R - r}{2}$$

which is half the difference between the two resistances required to produce a balance.

DIFFERENTIAL TEST FOR POLAR RELAYS

While on the subject of testing, it would seem appropriate to suggest a very effective method of testing polar relays without removing them from the set.

Wheatstone and other types of polarized relays are required to meet certain conditions in order that they may operate with a maximum of efficiency.

One of the most important of these conditions is that the coil windings (main and artificial) must be differential if the instrument is to be used in a differential set.

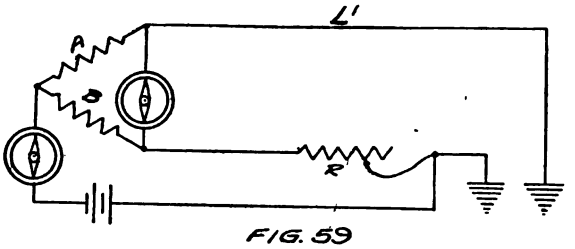

FIG. 59

The statement that a polar relay must be differential does not mean that both coils should measure ohmically alike. It is possible for the main and artificial windings to *measure* alike and yet to be *non-differential;* and, on the other hand, to measure *differently,* and still be perfectly *differential.* The variations in resistance are not important as long as the number of turns for both windings around the magnet core are properly insulated from each other and are exactly alike.

The test herein shown may be made with either the Wheatstone or ordinary polar relay type. The battery in the set is first switched off. In the case of a combination or vibrating type of Wheatstone relay, all battery is disconnected from the local opposing, accelerating or vibrating coils. The wire leading from the differential mil-ammeter to the terminal connection (D) is then disconnected and a small piece of wire is bridged across the terminal connections D and (D).

The armature tongue of the relay is "centered" and is so adjusted that there is an air gap of approximately .008 inch between the tongue and either of the contact points.

When the battery current (either positive or negative) is switched on, it flows through only one side of the mil-ammeter, thence through the line coil between connection (U) to D. Then (by means of the small piece of wire shown as a dotted line in Fig. 60), the current flows through the opposite coil in a reverse direction to that of the coil previously traversed. If the magnetic resultant due to the current flowing through both windings is equal, then the effect is a neutralization of one winding upon the other.

If the relay is differential, the opening and closing of the battery key or polechanger will not affect the tongue of the instrument.

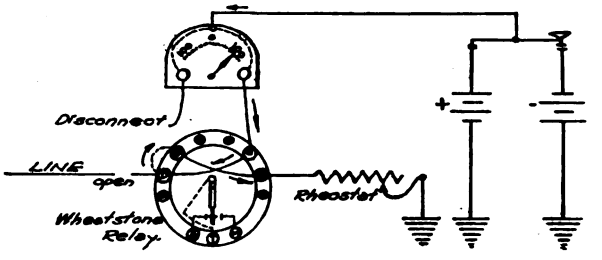

FIG. 60

The testing current should be at least 100 milliamperes, which can be obtained by varying the artificial line resistance in the combination rheostat until the required value of current is indicated on the mil-ammeter.

With the ordinary type of polar relay, the connections are made as shown in Fig. 61, and are substantially the same as those made with the Wheatstone type instrument.

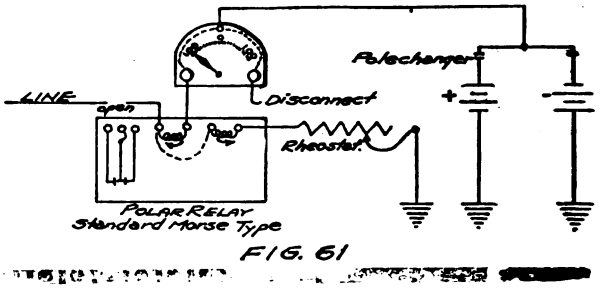

FIG. 61

The next following lessons will take up the consideration of certain phases of line balancing together with apparatus adjustments on duplex (Morse and automatic) and quadruplex circuits.

CORRECTION:

In Lesson 21, page 81, that part of the formula covering the Murray Loop Test and reduced to figures, should read:

$$\frac{100}{100 + 400} \times 500 = 100 \text{ ohms.}$$

(To be continued.)

Radio Buzzer Sets

TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, can supply buzzer sets for learning the continental alphabet by means of buzzer signals, the same as heard in telephone receivers used in regular radio working. These sets are equipped with key, high-tone buzzer, and flash lamp signal, complete on one base. The price is $4.00 for the set. Address TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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The Future of Radio Telegraphy

Wireless telegraphy, now an indispensable factor in American commerce and shipping, is destined for a far wider commercial utility, is the prediction of the National Bank of Commerce, in a survey of wireless and its relation to trade. Development of radio science has already provided the nucleus of a comprehensive system of world communication and has largely eliminated necessity for reliance upon cables dominated by foreign Governments.

"Although American commerce now has at its disposal more complete facilities for international radio communication than are available to the business interests of any other country, and American plans for a substantial increase in the available service are in a more advanced stage than elsewhere, nevertheless all the older European nations, as well as the new States which were organized as a result of the war, have embarked on a policy of furthering to the greatest possible degree the extension of the new method of international communication.

"Recent events make the growing commercial use of radio of special significance to the United States.

"While it is not seriously contended that radio telegraphy will replace the telegraph and cable systems, it supplies a most valuable supplement to present cable facilities as well as an extension of direct telegraphic communication with centres which cannot be reached by cable either because of geographical position or because of the present prohibitive cost of new cable lines.

"In addition to the progress made since the beginning of the war in direct international communication by means of radio telegraphy, wireless has begun to play a most important secondary part in the world's shipping industry. At any instant of the day or night any ship equipped with wireless can be reached and instructions issued to the captain regulating the speed, ordering diversion from one port to another or giving any necessary information.

At the same time the master of a vessel is not only provided with a means of communication which is almost certain to bring him speedy aid in case of accident, but he can, on approaching port, advise his owners as to the hour of arrival, the amount of fuel and stores which he will require and any special details which might affect the preparations for docking the vessel or for discharging cargo. By means of this service the turnabout time of cargo steamers can be materially reduced and a material economy in the cost of operation effected.

"When it is recalled that the operating expenses of even a moderate sized cargo steamer under present conditions are in excess of $1,000 per day, the importance of the total aggregate saving effected by means of radio communication becomes apparent. Messages ordering diversion for one reason or another are sent to an average of ten vessels daily from the port of New York alone.

"The development of radio communication of all types during the past ten years clearly indicates that the future holds large possibilities for the further rapid extension of the system and would seem to make imperative the formulation of national and international codes and regulations based on a prospective aerial traffic infinitely greater than the considerable total now in existence. The present international radio telegraph convention, to which the United States is a signatory party, is now out of date and the preliminary communications conference has been considering the steps necessary to bring both the convention and regulations into conformity with present needs and practice.

"There should be in this connection also a clarification of the respective spheres of Government and privately operated stations and a permanent policy laid down to govern their relations. This is necessary if both Government and commercial traffic are to obtain the benefit of adequate facilities. As long as an uncertain attitude is maintained toward privately owned radio systems neither a Government nor private capital is likely to receive the full benefits of a trained staff and up-to-date apparatus, all operated in the close co-operation which is possible only where the permanent status of the organization is assured."

THE International Bureau of Communications, located at Berne, Switzerland, has just issued a map showing the cables of the world. The map measures 21 inches high by 35 inches wide. There are fifty-five submarine cables shown on the map. Copies can be obtained at 50 cents each from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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EDITORIAL COMMENT

An Inspiration for President Harding

President Harding has on his desk in the executive offices at Washington, a group photograph of nine people taken on the front porch of his Marion, Ohio, residence last autumn. The President says that the picture has been a reminder and an inspiration to him many times, a reminder of the unlimited possibilities of American life, and an inspiration to all effort that those possibilities may be preserved and broadened.

Let me point out some of them, he says: "Here is a man who started life as a water boy on a railroad construction gang, became a telegrapher, and is now a millionaire captain of industry—head of a great industry which he conceived, built and controls.

"Next to him is another with a like beginning; a poor boy who had little education and no chance but what he made for himself out of this country's opportunities. He is one of the most important railroad executives in Ohio today.

"Here is one of the men who have made Marion; he was a farm boy in this county, didn't know what it would mean to have a dollar to spend freely. Now he is a dominating figure in one of the largest manufacturing industries in the State—an industry whose products go literally all over the world. Down in the bottom row is a young man who came up by the same route. He had nothing, and imagined himself well started toward success when he became a country telegraph operator and station agent, while yet a mere boy. He has risen step by step to be, today, general manager of one of the country's great railroads.

"So on through the list. No man in that group of nine started with apparently, an even start for success. They all know the hard ways, the real privations. Their story tells us what America means, and why we must make it continue to mean opportunity and inspiration, and the reward of merit. Every work to that end is to be commended and encouraged."

The names of the persons shown in the photograph are: Charles O'Donnell, Warren G. Harding, E. M. Costin, T. J. Hayes, George B. Christian, Jr., J. F. Prendergast, O. S. Rapp, J. A. Schroeter and William Michel.

THE printed proceedings of the forty-third annual meeting of the Gold and Stock Life Insurance Association, New York, held on January 17, 1921, are now being distributed among the members. The booklet is neat in appearance, contains much valuable information and reflects credit on the Association, of which H. W. Dealy, New York, is secretary.

Disposition of the Former German Cables

Informal conferences that have been in progress for more than a month among representatives of the State Department and delegates to the International Communications Conference, at Washington, D. C., have reached the point where tentative decisions have been made for a definite distribution of the former German cables. Prospects now are that final agreement will be reached very soon, based on the tentative understandings that have so far been arrived at informally.

In this allocation of the cables, it is now understood, the United States will receive full ownership of the line from Guam to Yap, in the Pacific, and the line from New York to Brest, in the Atlantic. This was decided on March 18th, following a conference between Norman H. Davis, former Under Secretary of State, American delegate and chairman of the Communications Conference, and Baron Kijuro Shidehara, the Japanese Ambassador, who is now acting as Japan's principal delegate to the Conference. Technical reasons are understood to prevent the immediate official announcement of the tentative agreement, Jules J. Jusserand, the French Ambassador and delegate to the Conference, is understood to be waiting instructions from his government, which are expected, giving France's assent.

Unless this tentative allocation understanding now reached is upset, England would retain the line she diverted from New York and Germany to Canada and England, while Italy would receive an important link in one of the Azores cables, and a large allotment of former German cables would be made to France. Japan, it is understood, would obtain the former German cables from Yap to Shanghai and from Yap to the Dutch East Indies.

As the terms of the tentative understanding are understood, Japan insists upon Japanese operation of the Yap end of the Guam-Yap cable until the status of Yap is determined, and Holland would operate the Dutch East Indies end of the third cable running from Yap. The question of the status of Yap is understood to have been differentiated from the cable allocation question in the tentative understanding, but the American position that Yap necessarily must be considered as vital in any communications system in the Pacific is still being maintained.

The Communications Conference is not taking jurisdiction over the question of the status of Yap, that being left for adjudication between the United States and the principal allied powers.

Dutch Oppose Control of Their Cable to Yap

Holland is against negotiations with any individual power concerning the control of the cables from Yap to Minado, Celebes, in the Malay Archipelago, or Shanghai.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

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Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

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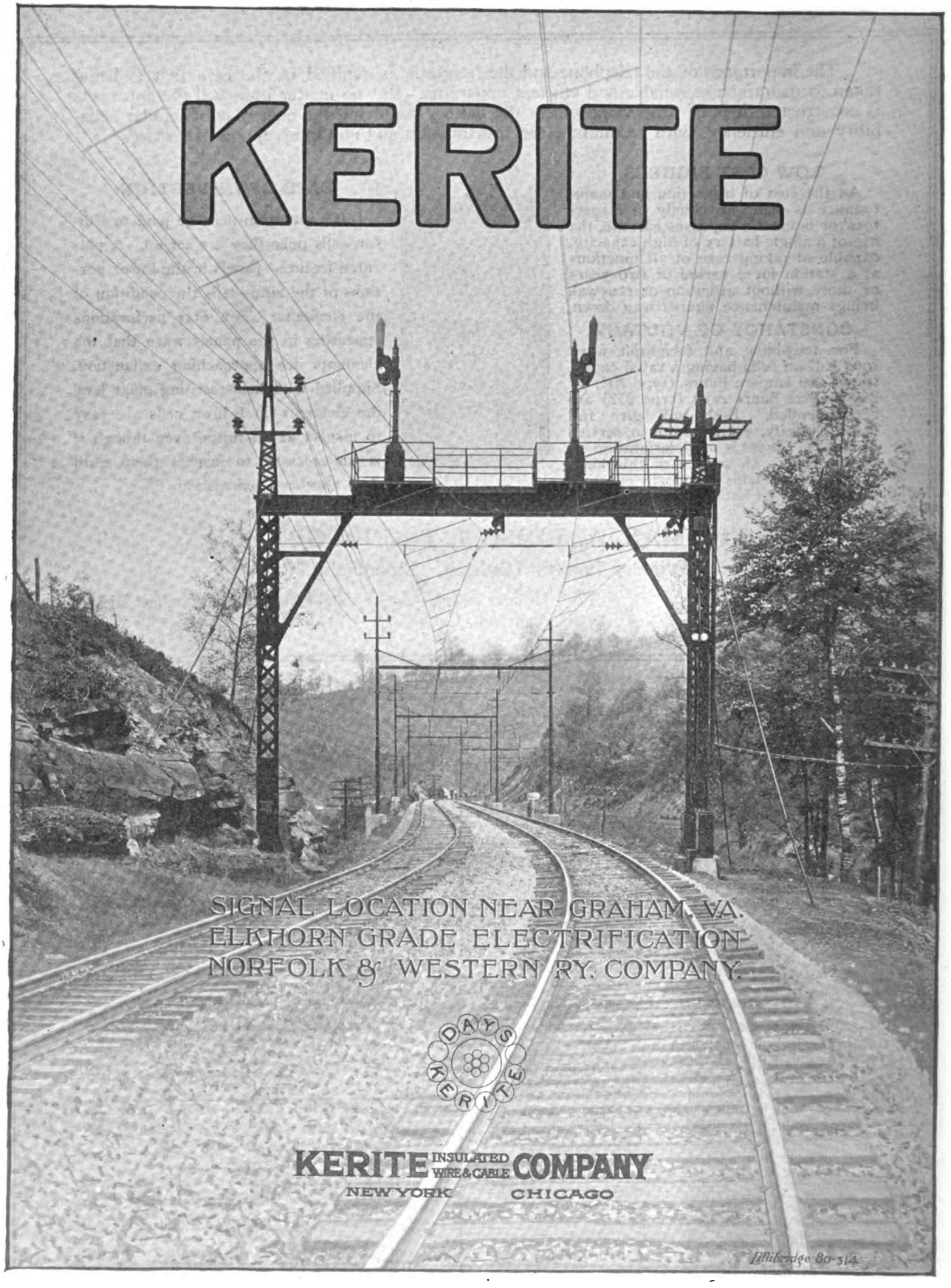

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THE RAILROAD
TELEGRAPH AND TELEPHONE

H. HULATT, manager of telegraphs, Grand Trunk Railway, Montreal, was a New York visitor on March 15th.

THE committee of direction of the telegraph and telephone section of the American Railway Association will meet in Chicago on Wednesday, April 6th, to pass on any business that may come before it, and the accumulated routine matters pertaining to its work. The committee of direction consists of: H. Hulatt, Montreal, chairman; W. H. Hall, Denison, Texas; R. F. Finley, Cleveland; J. F. Caskey, South Bethlehem, Pa.; E. A. Chenery, St. Louis; E. E. Dildine, St. Paul, Minn.; G. D. Hood, Chicago; J. McMillan, Montreal; C. S. Rhodes, Indianapolis, Ind.; E. C. Keenan, New York, and G. A. Cellar, Philadelphia.

THE Grand Trunk Railway Company have recently erected and put into operation a private long-distance talking circuit between Montreal, Quebec, and Ottawa, Ontario, a distance of about one hundred and twenty miles. This is the first of its type erected by the railway, although the majority of the roads have gone in extensively for telephone train dispatching circuits.

Substituting Message For Telegram

Judge Brown, of Ogdensburg, N. Y., is credited with having suggested the word "telegram" in relation to a message coming over a telegraph line. This was in 1850, six years after the telegraph was introduced commercially.

Prior to that date it was customary to employ the words "message," "despatch" or "telegraph" where now the word "telegram" is used. There has been some consideration given by railroad telegraph officials to changing the word "telegram" to "message," because in these days a lot of railroad wire messages are sent by telephone, and many believe that the word "telegram" gives the idea that the message was handled by telegraph, which is not the case on a great many railroads that handle most of their way-station messages by telephone.

Many members of the Telegraph and Telephone Section of the American Railway Association, in the interest of accuracy, have given some thought to this subject, and it is more than likely that the question will assume definite form in the near future, now that the telephone is displacing the telegraph to a large extent on the various railroads throughout the United States and Canada.

W. MORANTZ, manager and wire chief of the Atchison, Topeka, and Sante Fe Railroad, East Las Vegas, N. M., writes: "We consider the AGE a fixture here."

Clocks Regulated by Radio

After long experiment there has been constructed at Plainfield, N. J., a clock designed to be automatic in its operations and corrected daily by the radio impulses sent out from Washington. Up to the present time the correction of timepieces has depended upon wire circuits in which the clocks to be corrected were connected, or upon the use of head phones and stop watches and the human element.

T. S. Casner and O. L. Badger, of Plainfield, developed the clock. It is self-winding and is automatically synchronized with the Washington Observatory time each day at noon. Besides indicating time itself, the clock is arranged to operate and control any number of secondary clocks, and a correction in time on this master clock corrects the entire line of secondary clocks which it controls.

Put Your House in Order

The note struck by President Harding in his inaugural address relative to the necessity of puting our public household in order is a note fraught with meaning to millions of individuals in this country who have made little effort to put their private households in order. The urge of thrift and economy is strongest with too many wage-earners in America only when the financial pinch, arising from unemployment or sickness or high prices, comes. Yet this pinch will seldom be felt if, as President Harding says, we practice "a rigid and yet sane economy, attended by individual prudence and thrift which are so essential to this trying hour and reassuring for the future."

The practice of thrift is commendable at all times. Individual financial emergencies are continually arising, and to set one's household in order by planning a programme of "rigid yet sane economy, attended by individual prudence and thrift" is to ward off the serious consequences of such emergencies.

Direct United States Cable is Bought by Great Britain

H. Pike Pease, assistant postmaster-general, in the House of Commons on March 14th announced the purchase by Great Britain of the direct United States cable for £570,000, including £100,000 worth of cable stock and three cable stations—at Ballinskelligs, Ireland; Harbor Grace, N. F.; Rye Beach, N. H., and Halifax, N. S.

The cable that has been bought is intended as a reserve for the existing imperial cable and has been leased for a short time to the Western Union Company for £57,000 per year.

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CURRENT EVENTS

EXECUTIVE OFFICE ANNOUNCEMENTS, PERSONAL MENTION, APPOINTMENTS

PERSONAL

T. F. PURVES, assistant engineer in chief of the General Post Office, London, England, has written a long article on "The Post Office and the Telephones," which is a defence of the Department's policy. The article is being widely printed. The telephone controversy now raging in England on the subject of revised charges for telephone service is handled in a masterly manner by Mr. Purves, and his statements will go far to allay the present animosity that is being hurled by the British people against the telephone management.

MARIE CURIE of Paris, France, the discoverer of radium, will visit the United States in May, and will be the guest of Mr. and Mrs. Thomas A. Edison for a few days.

N. T. COLLETTE, a well-known old time telegrapher, who represented the California Raisin Company, with headquarters at Atlanta, Ga., has transferred to the same interests with headquarters in Jacksonville, Fla.

T. WALSHE TURNER, telegraph superintendent of the United Railways of Havana, Cuba, was a recent New York visitor.

MRS. ANNIE M. DELANY, wife of Patrick B. Delany, the well-known inventor of telegraph and other electrical apparatus, died at her home at South Orange, N. J., on March 21st. Interment was at Nantucket, Mass.

POSTAL TELEGRAPH-CABLE COMPANY

THE Postal Telegraph Commercial Cable System announces the laying of a new submarine cable between Miami, Fla., and Havana, Cuba, which supplements the present cable of that system from New York to Havana.

C. A. COMSTOCK, assistant to the general manager, recently spent several days in Norfolk and Richmond, Va.

W. C. DAVIET, assistant to the general manager, is visiting offices in the western division in the interest of the service.

Managers Appointed

J. C. Hall, at East Pittsburgh, Pa.; A. J. McGary, at Niles, Ohio; Martha Elliott, at Mishawaka, Ind.; L. W. Pollert, at Hopkinsville, Ky.; E. W. Capper, at Newark, Ohio; E. Curtis, at Guthrie, Okla.; A. G. Hitchcock, at Fayetteville, N. C.; W. E. M. Phillips, at Laurinburg, N. C.; W. J. Blair, at Wilson, N. C.; J. W. Shaw, at Elizabethtown, N. C.; C. S. Wood, at Baton Rouge, La.; H. S. McKagen, at Greenwood, S. C.; Chas. DeDobbleer, at Hannibal, Mo.; Edward Hintz, at Owosso, Mich.; R. Badsky, at Topeka, Kan.; R. V. Robinson, at Alton, Ill.; E. C. Nordstrom, at Traverse City, Mich.; M. B. Jones, at Champaign, Ill.; S. B. Grissom, at Muncie, Ind., and S. B. Winebrinner, at Frankfort, Ky.

C. F. BARTLETT, chief operator of the St. Louis office, who has been absent on account of illness for some time past, is said to be slowly recovering. He will not report for duty for at least two months.

Pittsburgh, Pa.

THE sympathies of the entire force are extended to both L. J. Mackay, chief clerk, superintendent's office, and W. H. Bassett, manager, Pittsburgh, Pa., both of whom lost their mothers during the past week.

MISS ANNA MCCAULEY, operator, and Miss Ruther Reisdorf, timekeeper, have returned to duty after being absent on account of illness.

RECENT additions to our operating force are G. K. Biber, Grant W. Bossler and Chas. R. Brooker.

New York Main Operating Department

W. F. STERLING, who recently returned from his vacation, was taken suddenly ill and died on March 15th. He was one of the oldest employees in the main office, being with us since the days when we were located at 187 Broadway.

MISS A. MANNELLA is sporting a diamond ring. Dame Rumor has it that she will leave us in June.

R. C. CARR, loop chief, has left us for an extended trip to the Pacific coast. Walter Redlefsen, formerly of the A. E. F. and a hero of the World's War, succeeds Mr. Carr on the loops.

THE following promotions were announced on the night force: N. C. Pastroff, southern quad chief; Geo. Mitchell, southern wire chief, and A. F. C. Peterson, night wire chief.

THE congratulations of the force is extended to Mr. Locker, who was married recently to Miss M. Ornstein, formerly employed by this company.

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WESTERN UNION TELEGRAPH CO.

NEWTON CARLTON, president of the company, was at Washington, D. C., business visitor the past week.

P. J. TIERNEY, of the Western Union Cable office, 40 Broad Street, has been designated by the Commandant of the Third Naval District as the Commandant of the Thirteenth Division, First Battalion of "the Tentative Organization of Personnel of the United States Naval Reserve Force who reside in the State of New York." Lieutenant Tierney's division is composed of about one hundred men residents of the villages of Whitestone and Winfield, Long Island.

Eastern Division

A NEW independent office was opened at Vineland, N. J., on March 1st.

MISS B. SHARP, of Hagerstown, Md., has been appointed manager at Salem, N. J.

W. H. LINDER, manager at Morristown, N. J., is on furlough in Florida on account of sickness.

H. E. AUSTIN. manager, No. Tonawanda, N. Y., has returned to duty after an absence of one month on account of ill health.

MISS E. M. MARCHE, formerly manager at Fairport, N. Y., has been appointed manager at Westfield, N. Y.

WM. WALSH, formerly of Buffalo, has returned to the service as office manager at Pittsburgh, Pa.

H. C. ENGLISH, of Superintendent J. S. Calvert's office, Philadelphia, has been appointed district commercial manager in the West Virginia territory.

A MEETING OF MANAGERS was held at Albany, N. Y., on March 15th, and at Syracuse on March 17th, District Commercial Superintendent W. A Sawyer presiding. Among the other New Yorkers present were: John Simmonds, J. A. Hill, J. E. Mendelson, T. J. Meade, together with K. F. Rice, district commercial manager at Buffalo. Many local managers from various places were present at the conferences, which were held for the benefit of the service.

Philadelphia

CHIEF OPERATOR F. R. WEBB has been welcomed back to his desk after an extended period of illness. During his absence his duties were ably performed by General Traffic Chief H. V. Emanuel.

MORSE OPERATOR LEO CONFOY has joined the benedicts, and the best wishes of the entire traffic force go with him.

MISS EDNA BACHMAN, one of the most popular check girls, recently died of pneumonia. The entire office will miss her pleasant personality.

R. W. SHADE has been appointed night supervisor of the ways division.

MORSE OPERATOR J. A. BAILEY has requested his vacation the last two weeks of April. There's a reason. Both he and Miss Garvey have the best wishes of the entire force.

THE multiplex department has organized a baseball team, with Tony Gagliardi as manager.

JOHN P. MCNALLY, clerk in the city superintendent's office, has been appointed acting manager of "F" branch office, vice Samuel Class, who has resigned to take up other work.

New York Western Union

THE New York Telegrapher's Aid Society held its annual election on March 29th at the 24 Walker Street office. The result of the voting will be announced in the next issue.

JOHN A. MCGINN, aged sixty-two years, construction foreman for this company, died in Brooklyn, N. Y., on March 16th. He was a brother of Joseph McGinn of the Associated Press.

ERNEST O. LARSON, inspector for Western Union Telegraph Company, died in Brooklyn on March 13th. Mr. Larson was born in Norway. He is survived by his wife, two sons and a daughter.

A MULTIPLEX equipment has been installed between New York and Scranton, Pa.

MRS. KATHERINE MCDONALD is away on sick leave, and Miss Bardash is on her vacation. Both are employed in the way division.

MISS JULIA MARKS, of the commercial news department, has returned from her furlough spent at Atlantic City.

EDDIE FREUND is spending his vacation in the wilds of Connecticut.

MRS. GEORGE JURGENSON, formerly Miss Ethel Carver, has resigned to take up domestic duties. Joseph Courtney has succeeded Miss Carver as Chicago grain clerk.

Lake Division

THE Chicago *Tribune* is conducting a Beauty Contest. As proof that the Western Union girls are as beautiful as they are efficient, a group picture of nine of them was recently taken and forwarded to the *Tribune*. The names of those in the group are: Mabel B. Brockway, Marie McCambridge, Louise Beystrom, Lucille Giroux, Grace Rose, Marie Krause, Dorothy Beckett, Pauline Scheffel, and Jeannette Kirschner. They are all employees of the Chicago main office and were chosen by their associates.

IN response to the query as to what he considered the qualifications for a good messenger, a Chicago branch office messenger replied: Know the room numbers and repeat your calls. Do what the clerk or manager tells you. Take off your hat when you go into the office. Help keep your office clean. Be clean, be quick, and work hard. In reply to the question, "What would you do if you got a call from 1008?" he said: "I would ask them did they call W. U., and if they gave me a message, I would say, 'Thank you,' and if they didn't, I would say, 'Thank you,' anyway, and report no call."

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M. L. SMITH, manager, Fond du Lac, Wis., after thirteen years of faithful service, serving in all positions from messenger to manager, has severed his connections with the telegraph and become a member of a recently incorporated company, which will be known as the Trier Clothing Company. Mr. Smith will have an opportunity to try out the valuable "selling" ideas which he assimilated in the telegraph service. His friends wish him every success in his new association.

THE death of J. O. LeTourneau on February 22nd, at his home, Evanston, Ill., is noted with sorrow and regret by his many friends in the telegraph fraternity. He entered the service of the Mutual Union Telegraph Company when eighteen years old and remained as manager of the Western Union after the Mutual Union was absorbed by the Western Union. After a long railroad experience, he re-entered the Western Union service in Chicago in 1905, where he remained until his death. His brother, F. A. LeTourneau, was "loop" chief in Chicago for many years until drowned in 1907. Mr. LeTourneau is survived by a wife and three sons—F. L. LeTourneau, district commercial manager, third district, Chicago; H. O. LeTourneau, formerly an operator in Chicago, now foundry manager, Battle Creek, and A. P. LeTourneau, who also was connected with the Western Union some years ago.

When the new Western Union Building, at 427 South La Salle Street, was put into service almost two years ago, the quarters for the women, on the second floor, were furnished with solid and substantial chairs that could withstand being thrown across the room, but which did not lend themselves readily to more decorative purposes. Even the men responsible for the effect realized that something was lacking, and they called into consultation a committee of women. It was explained what had been done, what money was available to do more, and with a sort of "God have mercy on our soul" air, asked for "suggestions." Long years of making both ends meet and cutting her garment according to her cloth has fitted woman to deal with such an emergency, and these women reveled in the opportunity to show what they could do.

There were willing hands to help at every turn, to eke out the lack of money, and a particularly capable pair of hands and a head always at the committee's service belonged to Miss Marthe Wiese. Nominally a clerk in the plant department, but actually a trained interior decorator, she put her skill and experience into the designing and arranging of rooms and furnishings, made the parchment candle and lamp shades, suggesting colors for walls, carpets and curtains, and the whole result is a tribute to her skill and the efficient direction of Miss Ruth M. Keig, recreational director.

How successful they were might have been inferred from the enthusiasm displayed when the rooms were finally thrown open on Thursday, March 17th, for general use. Gay and sunshiny in their harmonies of green, tan, fawn and gold, with the sunlight streaming through the western windows, and spring blossoms massed in every available space, the rooms expressed the very spirit of spring.

And it was a genuine employees' affair. Tea, poured by Mrs. Reed and Miss McCann, was served by the nine pretty girls who had been chosen for the *Tribune* contest, and who represented every department, and Miss Keig, assisted by the committee who had planned the furnishing of the room —Miss Moller, Miss Hinckley, Mrs. Brockway and Mrs. Reed—looked after the comfort of the guests. These came from every floor, men and women, and there seemed to be a preponderance of the men, who realized that it would be their only chance to see the women's quarters. Superintendents Welch and Wyrick and other plant and traffic officials, Mr. Byers of Vice-President Willever's staff, New York, and the office and staff men from the general manager's office, were among the other guests. Mr. Cronkhite, who was out of town, sent, with his compliments to the women employees, all the jonquils and daffodils which decorated the rooms

And particular credit is due to Miss Lillian Krca and Margaret Cross for their help during the afternoon. Someone has to stay behind the scenes and wash dishes, but if you think it is easy to do when you are sixteen and can only catch provocative glimpses of the gayety between the screens, you do not know that it is of such stuff that heroines are made.

The New Chicago Western Union Office

The New Chicago Western Union Telegraph Company's office, which is the largest in the United States, has among its equipment in the operating room 141 duplex sets, 54 quadruplex sets, 19 universal duplex repeaters, 21 half repeaters, 28 single line repeaters, 18 duplex half repeaters, 2 rotary repeaters and 2 metallic repeaters. The most generally used repeater for high speed work is that known as the Universal Repeater. A new type of repeater known as the Rotary Repeater is used on important multiplex printer circuits. It not only serves to repeat the impulses accurately as is done by the Universal Repeater, but actually serves to correct, within limits, imperfect signals received when they are retransmitted. Metallic repeaters are used on metallic or underground circuits. Metallic circuits are favored as a means for securing transmission totally immune from extraneous disturbances such as the Aurora Borealis.

Messenger Boys Organized

The messenger boys employed by the Western Union Telegraph Company at Des Moines, Iowa, organized themselves into an association named "WUTCO." The organization is for the general uplift and betterment of the messenger boys.

This club was original with the Des Moines mes-

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sengers, and after having been organized two years, has grown to take in all of the messengers of the city, and several other WUTCO clubs have been formed in other cities.

The purpose of the Brotherhood is to bring about the binding together of the Western Union boys at the Des Moines office, for the development of health, fellowship, character, service at work and at home, social and neatness of appearance.

The messenger boy is more than what he is sometimes erroneously pictured.

The name for the Brotherhood was worked out and adopted by a committee of three, chosen for that purpose. The letters making up the name "WUTCO" were taken from their company's name, Western Union Telegraph Company. Chief Delivery Clerk Harold Schroeder is in charge of the Des Moines messenger force of approximately fifty boys, who never lack for entertainment and leadership.

These messengers furnished the evening's entertainment for the Boys' Clubs of the entire city at the Y. M. C. A. Auditorium recently. Their entertainment was pronounced the best ever given in the city by a Boys' Club.

Shipped Care Western Union

When M. E. Whiting, manager of the Western Union Telegraph Company, of Bakersfield, Cal., arrived at his office on the morning of Washington's Birthday, the delivery clerk informed him there was a package for him, and directed his attention to the messenger bench on which was seated a little boy about seven or eight years old, and sewed to his coat was a tag reading "Care the Western Union, Bakersfield, Calif." Piled beside him was a pasteboard box and a sack of oranges.

Upon making inquiries, the manager was informed that a telephone message from the Santa Fe Depot stated they had a boy there addressed to the Western Union. A messenger was sent to the depot to claim the shipment. The office force was somewhat at a loss to know which of the employees in the telegraph office had been presented with this family addition, but as all shipments are usually addressed to the manager, and considering the nature of this particular one, they were willing that the manager should take possession, possibly on the grounds of his experience, having four huskies at home.

The boy's name was ascertained to be Caldewood and that his parents lived in Oildale, a little town about five miles distant. The lad had traveled alone from some town near Rutland, Vt., wearing the tag as described. The office staff got into communication with the Oildale Drug Store, who sent word to the parents. They soon arrived at the telegraph office and took the boy in charge.

CHARLES E. SPENCER, of Parsons, Kansas, says: "The AGE furnishes some very interesting reading and is highly appreciated."

W. R. Williams, City Superintendent, Portland, Oregon

W. R. Williams, city superintendent, Portland, Oregon, is one of the youngest superintendents in the Western Union Telegraph Company's service. He has had a wider and more intimate working knowledge of the practical and executive end of the business through the experience gained in the various positions he has held than many of his older confreres. Mr. Williams was born in Murfreesboro, N. C., July 31, 1892. He entered the Western Union Telegraph Company's service as a messenger at fourteen years of age at Elizabeth City, N. C., to which point his parents had moved. Passing through the positions of clerk, operator and manager, he was promoted to the assistant managership at Norfolk, Va., in 1915. A year later he was in the traffic department at Richmond, Va., as assistant chief operator, and within twelve months received the appointment of chief clerk to the district commercial superintendent at that place. While holding this position in 1918 he was called to Washington, D. C., as chief clerk to General Superintendent H. F. Taff.

During the tremendous strain on the telegraph facilities in Washington during the war, when super-normal conditions had to be met, he was made manager of the Washington office, remaining there until the restoration of the telegraph facilities to private ownership. Mr. Williams' next advancement was on October 1, 1919, when he was made city superintendent of Portland.

W. R. WILLIAMS, PORTLAND, OREGON

He is of the progressive type with the ability to build up a responsive organization and get results. Remarkably well balanced for his years, and possessing unusual analytical power and personal courage, Mr. Williams is well qualified to occupy a higher place in telegraph circles.

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The Barbados Western Union Cable

Federal Judge Augustus N. Hand on February 5th handed down an opinion denying the petition of the United States government for the right to prevent the Western Union Telegraph Company from laying its cables from Barbados to Miami, Fla.

By his decision Justice Hand refused to grant an injunction to prevent laying the cable, and at the same time vacated a restraining order previously granted against the Western Union Company.

United States Circuit Court of Appeals on March 11th handed down a decision affirming the judgment of the United States District Court Federal Judge Augustus N. Hand, which refused to grant a preliminary injunction to the Government to prevent the Western Union Telegraph Company from landing its Barbados cable line at Miami Beach, Fla. The Government had also sought to prevent by injunction the sending of cable messages originating in, or addressed to Brazil over the Key West-Cojimer, Cuba, cable.

The controversy turned upon the right of the President to exercise executive power to prevent the landing of the cables without a permit from the State Department. Judge Hand, in United States District Court, had found that the Western Union possessed the right to land such cable under the old Post Roads law of 1866. In affirming the decision of the lower court, the Circuit Court of Appeals said in part:

"The right to permit or to prohibit the landing of cables between foreign countries and the American coast is in Congress under its powers to regulate commerce between the United States and foreign countries. In point of practice, Congress on several occasions has done so by specific acts and some time the President has done so as Chief Executive, and sometimes cables have been laid by corporations without any permits. We think, however, no practice has been established sufficient to sustain the contention that the President has such power as Chief Executive, and we are inclined to think also that the Western Union Telegraph Company has the right to land this cable near Miami Beach under the Post Roads Act. However, as there is a necessity for putting this important case before the Supreme Court before it rises the order of the lower court is affirmed."

The Federal Government and the Western Union Telegraph Company on March 18th asked the Supreme Court to advance arguments on the suit to determine whether the President has authority to prevent the landing of a cable at Miami, Fla., without a proper permit. Both parties asked that the case be heard on April 11th.

All America Cables

R. E. BOND, recently of the Valencia, Ireland, staff of the Western Union Cable Company, has accepted a position with the Mexican Telegraph Company, in New York.

THE Washington, D. C., office of this company, located at 1126 Connecticut Avenue, is an extremely busy center. It is one of the most attractive cable offices to be found anywhere. R. J. Hewitt is manager.

W. S. BUCHANAN, of Rio de Janiero, Brazil, who lately underwent an operation in New York, has fully recovered and will remain at headquarters as acting superintendent of staff.

J. G. MURRAY has been appointed assistant to Vice-President A. Davidson, New York, and will also act as superintendent of traffic.

J. PASCHETAG has been appointed assistant manger at Galveston, Texas. He was one of the first members of the New York staff.

W. J. TUREGANO, of New York, has been appointed manager at Santiago, Cuba.

C. WOOLDRIDGE has been appointed manager at Santiago, Chile, vice C. F. Skinner, transferred to Valparaiso as assistant manager.

A. B. BEAVEN, station electrician from Buenos Aires, Argentine, has gone to England on furlough.

Commercial Cable Company

The Commercial Pacific Cable Company has recently completed the laying of an underground cable between the towns of Sorsogan and Bacon, across the Sorsogan Peninsular, lower Luzon Island, Philippines. This underground will connect at Bacon with the Commercial Pacific Cable Company's submarine cable running from Guam, and at Sorsogan will be joined up with a section of submarine cable running to Manila. This change has been made to remove the submarine cable from the San Bernardino Straits, where strong currents and rough bottom have frequently been the cause of interruptions. The underground cable was manufactured by the Okonite Company, Passaic, N. J., and was laid under the direction of the Commercial Pacific Cable Company's engineer, Maynard Dodd. The whole change is expected to be completed by the end of April.

The cableship *George Ward* is at present engaged in repairing one of the French Company's cables off the coast of France. This will be her first work as a cableship. The *George Ward* was formerly the steam yacht *Beryl,* and was at one time used by the Prince of Monaco for deep sea research work in all parts of the world.

This company has opened a new cable office in the industrial centre located at 75 Edmund Street, Birmingham, England, with direct connection with the ocean cables.

WE are informed by Cuban railroad and telegraph authorities that many telegraph operators in the United States are writing to officials in Cuba asking for positions. These authorities wish us to make it known that no one but those who can speak Spanish fluently have any chance of securing employment in Cuba.

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A New Radio Record

A NEW world's record for speed reception of the Continental Morse Code was set on March 18, 1921, at the first annual convention of the second district radio council, which was held over a period of four days at the Pennsylvania Hotel, New York.

This contest was open to the world, and experts from the Navy, Radio Corporation of America, and cable men from the Western Union participated. In all, the contestants numbered about sixty. About two-thirds of the contestants dropped out when the speed reached 35 words a minute. At 42 words there were 8 left, and at 45 only two—B. G. Seutter of the Times Radio Station, and N. Bernstein, of the Western Union Telegraph Company, New York. So close and so well matched were these two that three separate runs were necessary before the judges declared Mr. Seutter winner. Mr. Seutter had two errors and Mr. Bernstein had three. The result was in doubt till the end. The record set by these two contestants was 48 3-5 words per minute. The former record was held by Tony Gearhart, of San Francisco, who attained a speed of 47 words per minute with 3 errors. Mr. Seutter received a cup from the Radio Council as a prize. Mr. Bernstein at present is a student in the testing and regulating class at 24 Walker Street, New York.

Radio Corportion of America

EDWARD J. NALLY, president of the Radio Corporation of America, made the following announcement on March 23d: "The United Fruit Company has acquired a substantial minority interest in the Radio Corporation of America. The United Fruit Company will be represented on the board by George S. Davis, who has been elected a director."

C. J. Ross, comptroller, accompanied by Mrs. Ross, sailed for Cuba on March 26th, on the steamer *Calamares* of the United Fruit Line. They will visit various points of interest on the island.

G. S. DESOUSA, treasurer, and David Sarnoff, commercial manager, recently spent a week-end at Atlantic City.

Old Time Telegraphers and Historical Association

Thomas E. Fleming, secretary of the Old Time Telegraphers and Historical Association, New York, visited Richmond, Va., on March 26th, where a meeting of the old timers of Richmond and vicinity was held. The vacancies caused by the deaths of C. W. Bradley, president of the association, and G. W. Stevens, vice-president, were filled by the election of General Joe Lane Stern, president, and E. P. Goodwin as vice-president. Both gentlemen were former telegraphers. General Stern is a lawyer in Richmond and adjutant general of the State of Virginia, while Mr. Goodwin is assistant to the general manager of the Chesapeake and Ohio Railroad Company. Other details of the meeting will appear in a subsequent issue.

Obituary

CHARLES P. WARREN, formerly an operator at Cincinnati, Ohio, died at Millboro, Va., on March 10th.

CLOYS M. FROST, a well-known Buffalo, N. Y., telegrapher, died in that city on March 14th. Mr. Frost was born in Buffalo in 1848, and entered the Western Union service in 1867. His entire telegraph career was spent in Buffalo. A few years ago he retired from active service.

WILLIAM J. MARSHALL, aged fifty-nine years, a well-known telegrapher at San Antonio, Texas, died on February 27th, after a lingering illness. He was born at Batesville, Miss., and was at one time a member of the Merchants' Exchange at St. Louis. Later he represented the Cella Commission Company in Texas. He was in the employ of the Western Union at San Antonio, Texas, for about ten years prior to 1918, since which time he was associated with J. S. O'Mealy and Company, cotton brokers.

WILLIAM J. FOSTER, aged fifty-seven years, general foreman of cable construction for the American Telephone and Telegraph Company, New York, died on March 21st. He had been forty-two years in the telephone service, and was the oldest American Telephone and Telegraph employee in point of service. Mr. Foster began his telephone career with the Cincinnati and Suburban Telephone Company on May 1, 1879. He transferred his services to the Metropolitan Telephone Company, New York, on July 1, 1883, and entered the employ of the American Telephone and Telegraph Company on January 1, 1888.

A Knowledge of Phillips' Code an Asset to the Telegrapher

Phillips' Code, *Latest Edition,* a thoroughly tested code of abbreviations, arranged for telegraphic purposes and contemplating the rapid transmission of press reports; also widely used as an easily acquired method of shorthand. Revised and brought up to date, with supplement to February, 1920. The new edition contains about 700 additions to the older code, and is indispensable to the operator who aspires to the standard of proficiency required by press associations, which includes a knowledge of Phillips' Code. Flexible cover, vest pocket size, $1.25 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

PORTER E. RAMSEY, formerly district plant superintendent at Richmond, Va., writes: "I enclose renewal check. While I have put twenty years of telegraph work behind me and am in the industrial world as a tire manufacturer, in which I am meeting marked success, I still cherish the pleasant associations of the telegraph and telephone people, and your publication keeps me in touch with them. The paper is just like a letter from home."

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CANADIAN

AMONG the appointments made by the district plant superintendents of the Canadian National Railway printed on page 144, March 16th issue, it was erroneously stated that D. A. Mitchell had been appointed supervisor of plant at Moncton, N. B. The name should have been D. A. MacNeill, instead of D. A. Mitchell.

An interesting return game of hockey took place at the Quebec Arena, Quebec, between teams recruited from the ranks of the Canadian Pacific Railway telegraph messenger staffs at Montreal and Quebec.

The game was very closely contested throughout, the deciding goal falling to the Montreal representatives just a few seconds before the expiration of the time limit. For the home team, Farrell, Quinn and H. McMahon in goals put up a stellar exhibition, while Alexander, Legault and Lavallee were the conspicuous satellites in the Montreal aggregation.

The match was very ably handled by Referees J. Roddick, Montreal, and C. Quinn, Quebec, and their strict rulings resulted in a very clean game.

A party of some eighty admirers, including no less than a dozen ladies, accompanied the Montreal team, and Manager Fred Prior is authority for the statement that everyone thoroughly enjoyed the little outing.

J. FRANK HOWELL, of 15 Whitehall Street, New York, an old-time telegrapher, for many years past in the brokerage business, recently made a 6,000-mile trip to South America, and has written the story of the voyage for the benefit of his friends. As Mr. Howell has a reputation for good writing, it is easy to conclude that what he has had to say in his twelve thousand word multigraphed story is intensely interesting. Mr. Howell will be pleased to send copies of his story with his compliments to those desiring them.

Practicing Thrift

Both President Harding and Vice-President Coolidge are men who have always practiced thrift and economy. Habits of thrift have been very instrumental in enabling them to attain the positions of power and influence they hold today.

President Harding and Vice-President Coolidge have lived as Uncle Sam wants every American to live—with an eye and a mind on the future. Eyes and minds will be properly directed if they are focused on the savings movement.

WANTED—$2,000; 6 per cent. Guaranteed Old time telegrapher wants a building loan for his family of seven children. Small amounts welcomed. First class reference. Address Old Timer, care TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Annual Meeting of the American Telephone and Telegraph Company

At the annual meeting of the American Telephone and Telegraph Company, held at 195 Broadway, New York, on March 29th, it was announced that, beginning with the dividend payable on July 15th, stockholders will receive 9 per cent. annually, instead of the 8 per cent. heretofore paid. The directors authorized President Thayer to make this announcement.

President Thayer explained that the change was nothing more than adjustment to a new set of conditions. "It has always been the policy of the company," he said, "to pay such a dividend as would maintain the market value of the stock at a premium sufficient to attract subscription to new stock issues."

Mr. Thayer indicated that the company plans to issue new stock from time to time to cope with growth. He believes that the issue of a fair proportion of new capital rather than simply increasing the debt to take care of growth, is a necessary part of any sound financial program.

While the 8 per cent. dividend was sufficient to maintain the stock at a premium to attract new capital, it has recently maintained the stock only around its par value of $100 a share.

"Par value indicates a satisfactory absorption of the present issue," Mr. Thayer said, "but no demand for more at the same rate of return. Stock must be at a premium to indicate a readiness to absorb further issues."

Mr. Thayer emphasized: "There has been no time within the past ten years when the company's earnings have not been sufficient to pay the higher rate of dividend."

The stockholders adopted a resolution whereby employees of the company may subscribe to stock to the extent of fifty shares a year. No part of the stock is to be handed over to employees until it has been fully paid for at not less than par.

The stock is to be sold to employees under terms and conditions which the directors shall announce at a later date.

At the executive meeting of directors following the stockholders' session, George D. Milne resigned as treasurer, and was succeeded by H. Blair Smith, assistant vice-president. The old officers, with this exception, were re-elected.

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Telegraph and Telephone Age

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CONTENTS

Automatic Wall Telephone and Automatic Desk Telephone. By Harry E. Hershey, Chicago, Illinois 170
Static Discharge Effecting Telephone, Telegraph and Power Circuits at Kendalls, Wis. 172
Recent Attainments in Wired Radio. By R. D. Duncan, Jr. (Continued from page 147, April 1st issue) 173
New Radio Device Records Signals Autographically. New Radio Station in Switzerland 175
Railway Time Service. By H. Hulatt, Manager of Telegraphs, Grand Trunk Railway, Montreal 176
Carrier Current Telephony and Telegraphy. By E. H. Colpitts and O. B. Blackwell 178
The Emancipation Proclamation. Vaudeville by Radio Telephony. German Wireless Telegraphy 179
Student's Course in Technical Telegraphy. By Louis Casper. Lesson 25 180
Editorial—Ownership Statement. President Harding on Radio and Cables. International Communications Conference. President Harding's Voice on Phone Heard 5,700 Miles Off 182
The Railroad—Chicago Meeting of the Telegraph and Telephone Section, American Railway Association. The Various Committees... 183
New President Old Time Telegraphers' and Historial Association. Annual Report Western Union Telegraph Company 186
New York Telegraphers' Aid Society. Electrical Aid Society of Philadelphia. Philadelphia. Obituary 187
Dyke's Automatic Electric Buoy Lamp 188
Prescribed by Radio 189
Personal. Postal Telegraph-Cable Company. Commercial Cable Company. The Telegraph Industry 190
Western Union Telegraph Company. Radio Corporation of America. All America Cables 191
Canadian. Publisher's Son "Cubbed" It 192

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Automatic Wall Telephone and Automatic Desk Telephone

By HARRY E. HERSHEY, of the Automatic Electric Company, Chicago

[In our April 1st issue, we printed an article under the title of "Theory of the One Hundred Line Telephone System." This contribution to the same general subject, "Automatic Telephony," follows in regular order, and as far as possible other articles on the same subject will be printed from time to time. The sequence will be maintained so that the readers may better understand the subject of Automatic Telephony, which is rapidly becoming common in telephone practice throughout the world.]

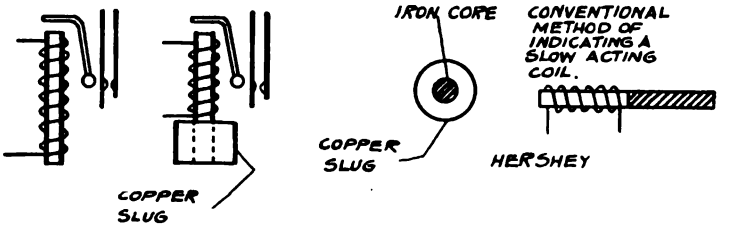

FIG. 2. SLOW ACTING RELAYS

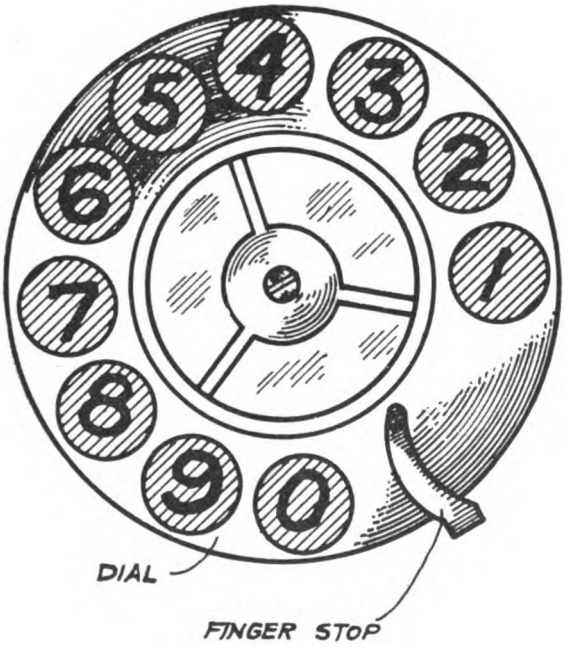

FIG. 3. FRONT OF DIAL

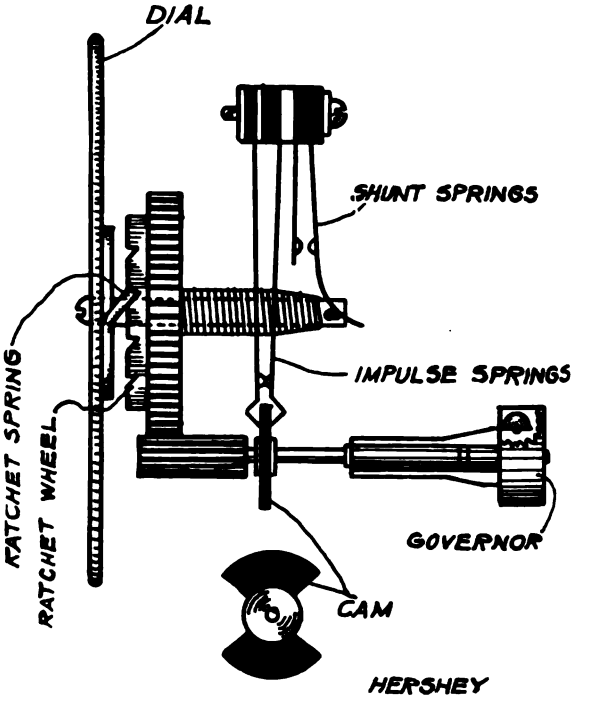

FIG. 4. CROSS-SECTION OF DIAL

THEORY OF THE SLOW ACTING RELAY

Before proceeding further with our study of the Connector Switch it is essential that the operation of the so-called slow acting relay be understood. At the left in Fig. 2 will be seen the conventional representation of a relay as ordinarily used in a telephone switchboard. In the next drawing a heavy ring or slug of very pure copper has been placed over one end of the core, occupying a portion of the space used for the wiring on an ordinary spool. The outside diameter of this slug is usually the same as that of the head of the spool, and the inside diameter is just large enough to allow the slug to fit snugly over the core. A relay of this type attracts its armature approximately as quickly as an ordinary relay, but when the circuit through its winding is broken, the current induced in the heavy copper ring causes the armature to be retained for the fraction of a second, giving it the slow acting feature. The degree of slowness depends, of course, upon the relation between the size of the copper slug and the ampere turns on the relay.

MECHANICS OF THE SUBSCRIBER'S DIAL

A fundamental requirement in automatic telephony is that a device be provided at the sub-station by means of which the subscriber can alter the electrical condition of the line in such a way as to cause the apparatus at the Central Office to complete the desired connection. This device takes the form of

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a dial, pivoted at the center so that it may be turned in a clockwise direction. (See Fig. 3.) For convenience in turning it has finger holes, ten in number, around its outer edge. Through each hole a figure appears; these figures run consecutively from 1 to 0 as shown. To call the figure 3, for instance, the subscriber places the tip of his finger in the hole through which the 3 appears and turns the dial to the right until his finger strikes the stop, whereupon the finger is removed, and the dial returns to normal under the influence of a spring, which was wound as the dial was turned in a clockwise direction.

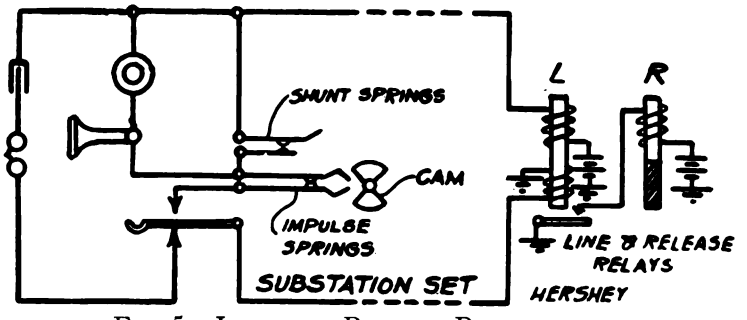

FIG. 5. LINE AND RELEASE RELAYS

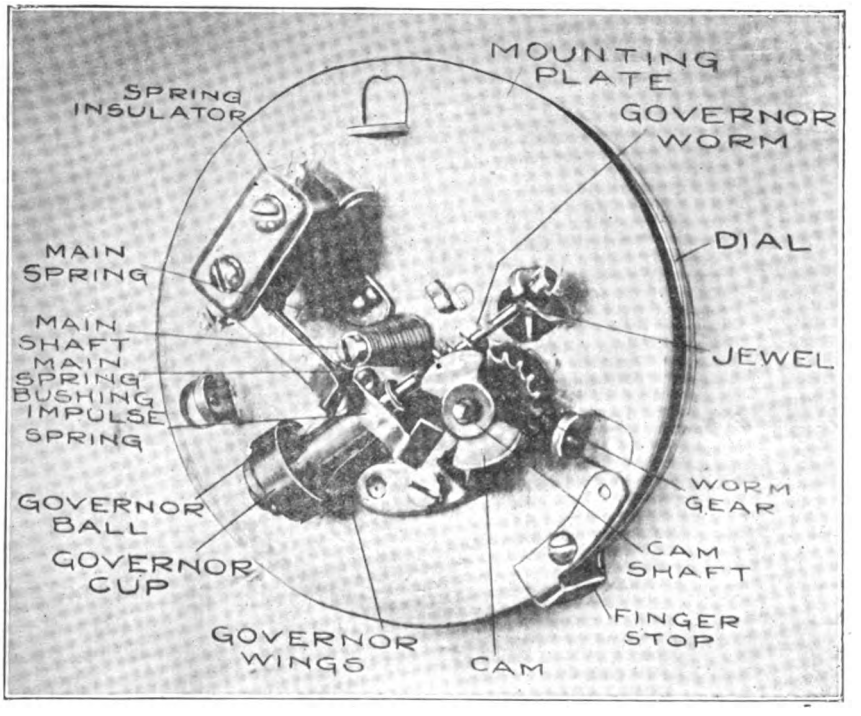

FIG. 6 WORKING PARTS OF DIAL, ACTUAL SIZE

In Fig. 4 we have another view of the same calling device. At the left may be seen the moving element or dial. As the dial is rotated in a clockwise direction no motion is transmitted to the gear train; the only result obtained is the winding of a coiled spring. Upon the removal of the finger after it has reached the stop, the dial will return to normal under the influence of the previously mentioned spring. By means of a ratchet this counter-clockwise movement is transmitted through the gear train to the governor, which will insure a uniform speed. In addition to operating the governor, the gear train causes the cam to be revolved in such a manner that it opens the impulse springs. The gear ratio is such that when 1 is called on the dial the cam will make one-half revolution, thus opening the impulse springs once. Thus it will be seen that whatever number may be called on the dial, the impulse springs will be opened a like number of times.

THE RELATION OF THE SUBSCRIBER'S DIAL TO THE LINE RELAY

In Fig. 5 is shown a diagram which represents the circuit arrangement at a sub-station. This consists of the ordinary switch hook, transmitter, receiver, ringer and condenser, and in addition a set of impulse springs and a set of shunt springs. At the right of Fig. 5 is shown the circuit of a line and release relay; they are of particular interest on

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account of the fact that they appear in practically all automatic switches.

When the receiver is removed at the sub-station a circuit may be traced from negative battery, through the upper winding of relay L, transmitter, receiver, impulse springs, upper contact of switch hook, lower winding of relay L to ground. The current flowing in this circuit will cause relay L to energize. Relay L, upon energizing, will close a circuit from negative battery through relay R, make springs on relay L to ground, whereupon relay R will become energized. Now let us assume that the subscriber dials the figure 1. When the dial is released and as it returns to normal, the cam is given a half turn, and one of its wings momentarily forces the impulse springs apart as it passes between them. This momentarily opens the circuit of line relay L, relay L de-energizes for an instant and in turn opens the circuit of release relay R. Relay R remains energized even though its circuit was opened momentarily, for the reason that it is a slow acting relay. If the subscriber had dialed the figure 4, the cam would have been rotated twice, thus opening the line circuit 4 times. From the foregoing we can conclude that for each figure called by the subscriber the line circuit will be momentarily opened a like number of times. From the discussion so far it is evident that each time the dial is operated a series of clicks will be heard in the receiver. To overcome this a pair of shunt springs are provided as shown. As soon as the dial is moved to an off-normal position these springs come together and maintain a shunt around the transmitter and receiver until such time as the dial returns to normal. It is evident that if the shunt springs were not used, the resistance of the subscriber's loop might vary, during the dialing period, due to a change of resistance in the transmitter. This would tend toward irregular operation of the Central Office mechanism and is obviated by using a shunt around the receiver and transmitter during the dialing period.

Questions

A. Assuming that the ampere turns remain the same, what would be the effect of increasing the amount of copper in the slug?

B. Assume that the coil is to be wound with 28-gauge wire and that the slug is one-half inch long. If we double the length of the slug will it double the slow acting feature of the coil?

C. What will be the effect if the slug is ever so slightly cracked?

D. What would be the effect if the subscriber attempted to force the dial back to normal? If the subscriber retarded the return of the dial?

E. If the subscriber should hold the dial in an operated position, would he be able to talk?

F. If the shunt springs failed to make contact, what would be the result?

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There is no method of making friends equal to the method of making good.

STATIC DISCHARGE EFFECTING TELEPHONE, TELEGRAPH AND POWER CIRCUITS AT KENDALLS, WISCONSIN

On March 5th, during an ordinary electrical storm, a violent electrical aerial discharge occurred at Kendalls, Wisconsin. It had the results and characteristics of an explosion of dynamite. At first it was thought a store of dynamite had exploded, but upon investigation it was found that it was entirely an electrical phenomenon.

Unlike an ordinary electrical discharge, it was not concentrated at any point, but was distributed over quite some area. The concussion was so severe that in nearly every business building from two to sixteen window panes were shattered. A window was completely blown out of the Chicago and Northwestern depot.

Overhead wires, such as telephone, telegraph and power circuits, were mostly affected. The telegraph circuits routed along the Chicago and Northwestern right of way were all grounded in air gap protectors in the Northwestern station. The insulated copper ground wire between the protectors and ground connections was fused, several holes were blown through the insulation, and the moulten copper metal was completely blown out of the insulating covering. In accordance with the freakness of the lightning discharge isolated parts of the telephone equipment used for train dispatching were burned and destroyed. The bottom of the cable box at the open wire terminal, which is about one hundred and fifty feet from the station, was completely blown out, but otherwise box and equipment were uninjured.

Practically all telephone circuits at Kendalls and immediate vicinity were out of service due to this storm. The relays controlling the crossing bells on the Chicago and Northwestern Railway were burned so that the bells rang continuously, which added more to the confusion. In the power house supplying the electrical energy for the city of Kendalls the switches on the power board were twisted into irregular shapes and forms.

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German Telegraph and Telephone Service

In a lecture delivered some time ago before the Reichsbund deutscher Technik (German Technical Union), Dr. Bredow outlined the financial position of the German telegraph and telephone service (2,000 million marks deficit in 1920), and suggested remedies for improving the position. The gist of the lecture as reported by the *Reichsbundes deutscher Technik* is that the large deficit is due to the extraordinary rise in the cost of materials and labor; the prices for iron wire have increased 3,000 per cent.; for copper wire 1,200 per cent.; for underground cable 2,000 per cent.; cable and flexible for internal connections 3,000 to 4,000 per cent.; and telephones 2,000 to 3,000 per cent.—*London Electrical Review.*

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Recent Attainments in Wired Radio

By R. D. Duncan, Jr.,

Radio Engineer Signal Corps, U. S. A., in the *Journal* of the Franklin Institute.

(*Continued from page* 147, *April* 1*st issue*)

In Figs. 15 and 16, respectively, are plotted values of the sending end reactance and resistance of the pair of lines employed, as functions of the frequency, for frequencies between 25,000 and 100,000 cycles per second; in Figs. 17 and 18, respectively, are plotted values of the same two functions in terms of the wave-length, for the range of wave-lengths 3000 to 300 metres (frequency 100,000 to 1,000,000 cycles per second). In Figs. 19 and 20, the variation of the sending end reactance and resistance of one line with ground return, as a function of the wave-length is plotted for wave-lengths between 3000 and 300 metres.

In making the reactance and resistance measurements, difficulty was experienced in obtaining the necessary accuracy required at the low frequencies (long wave-lengths). At times a change in frequency, which could hardly be detected by the wave-metre, was sufficient to cause the line reactance to vary from relatively high positive to equally high negative values. The physical conditions of the lines also seemed to vary at times during the measurement, causing the resonant point to rapidly shift back and forth with a consequent fluctuation in the ammeter reading. The points plotted in Figs. 15 and 16 were obtained with all possible accuracy and the curves drawn there through qualitatively confirm the prediction of the theory. The errors of observation in the wave-length values, from which the frequencies were computed, are magnified by the abscissa scale chosen for these figures which permits of plotting to a greater accuracy than could be obtained in making the readings; this particular choice of scale was made in order to secure greater ease in plotting.

In accordance with theory as shown by equations (3) and (4), if the line resistance and leakage conductance are negligibly small, for certain frequencies, the reactance should attain infinitely large values. A glance at Fig. 15 shows this not to be the case for the particular lines measured; so far as could be determined the reactance not only did not reach excessively high values, but passed through a second set of zero values. The actual measured value of the sending end resistance further shows that the resistance factor, which represents the combined effect of the linear resistance and leakage conductance, is not a negligible quantity. It will be observed on comparison of Figs. 15 and 16, that at zero reactance points where the slope of the reactance curve is positive, where data was obtained, the resistance reaches its minimum value; maximum resistance values are obtained also at zero reactance points, but where the slope of the reactance curves is negative; the average value about which the resistance varies is approximately 250 ohms. Points of zero reactance occur at intervals of approximately 6500 cycles from 28,000 to 75,000 cycles per second, beyond which up to 100,000 cycles per second, they occur at intervals of

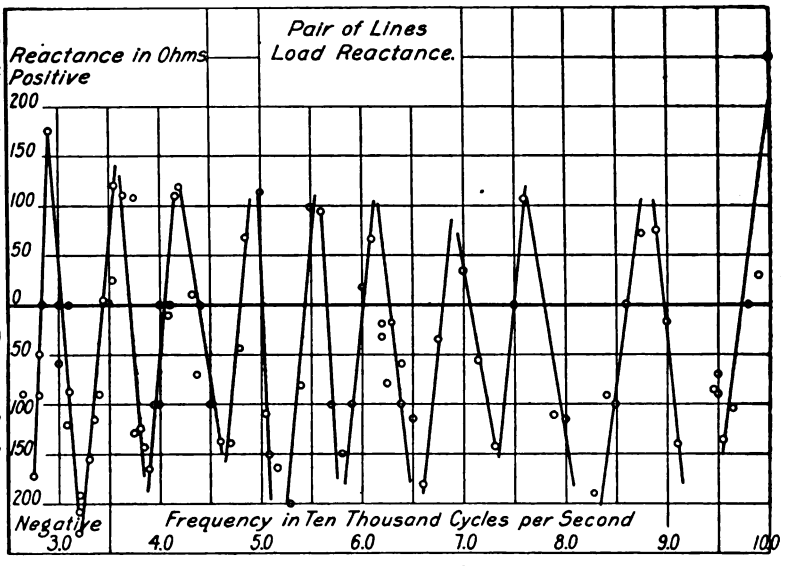

FIG. 15

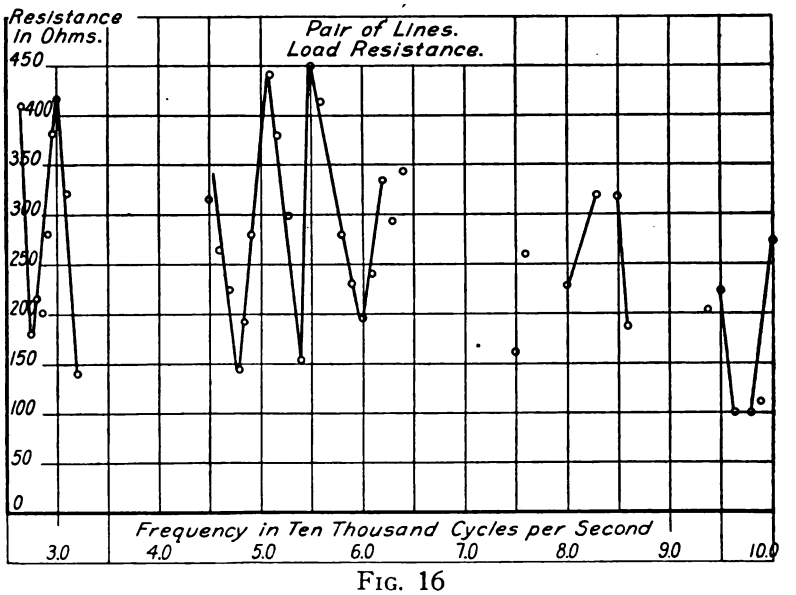

FIG. 16

nearly 11,000 cycles per second. The curves in general are similar to those obtained by Morecraft for an artificial line at low frequencies. The reactance and resistance measurements were made with the lines in ordinary telephone and telegraph operation as these are the conditions under which wired radio apparatus will be forced to work. The exact qualitative and quantitative confirmation of the theory is hardly to be expected since the line conditions under which the measurements were

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made differ widely from those assumed by the theory.

In Figs. 17 and 18, for accuracy and convenience, the reactance and resistance of the pair of lines, are plotted in terms of the wave-length, for wave-lengths between 3000 and 300 metres (frequency 100,000 to 1,000,000 cycles per second). Figs. 19 and 20 show the same quantities for one line and ground plotted in the same manner. From Figs. 17 and 19 it is seen that the periodic variation in reactance persists, as at the lower frequencies, but not in so definite manner, until a wave-length of 1600 metres (187,500 cycles per second) is reached, below which it remains positive in sign, but increases in a quite uniform manner; the pulsation in resistance values for both line and line, and line and ground, also continues as shown in Figs. 18 and 20, the average value in both cases decreasing until a wave-length again in the proximity of 1600 metres is reached, below which, similar to the reactance, it increases, more or less uniformly, at a very rapid rate, and in a manner similar to the resistance of a radio antennae. The resistance of the pair of lines at the very short waves averages about one-half of that of one line with ground return. This sudden transition in the properties of the line load is unique and is not to be entirely accounted for by the theory. The preponderance of the resistance of the line and ground load over that of a pair of lines, which manifests itself at the higher frequencies may be attributed to the more pronounced radiating properties possessed by the former type of load, at these frequencies. At the lower frequencies, the radiating properties of both systems become greatly reduced.

To check the accuracy of these curves and to test their validity when applied to actual practical cases, a number of artificial line loads were built up consisting of values of inductance, capacity and resistance, as nearly as possible equal to those as specified by the curves. Values of line current as a function of the series line capacity, were obtained, first for the real line load and then for the artificial line load of the constants specified. This data, plotted in the form of resonance curves for different frequencies, is shown in Figs. 21, 22 and 23.

(To be continued)

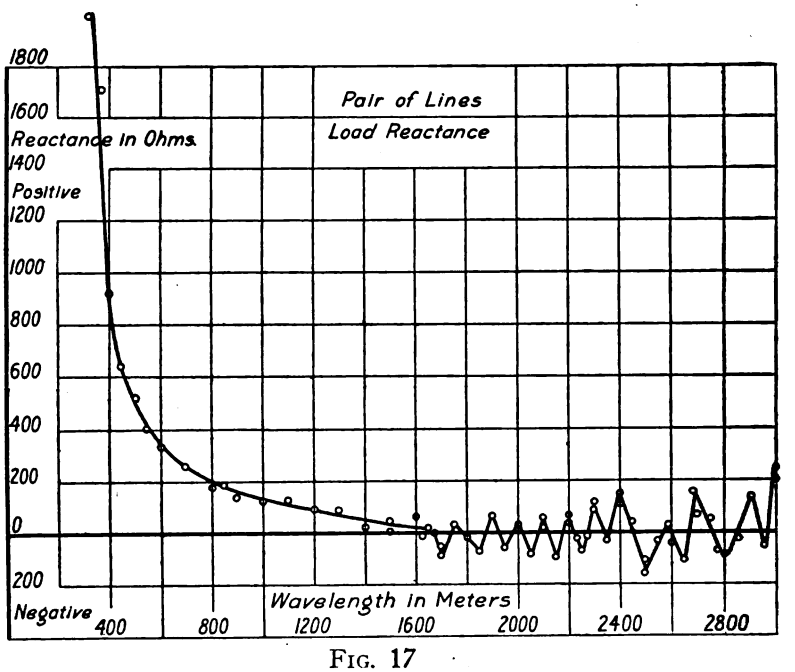

FIG. 17

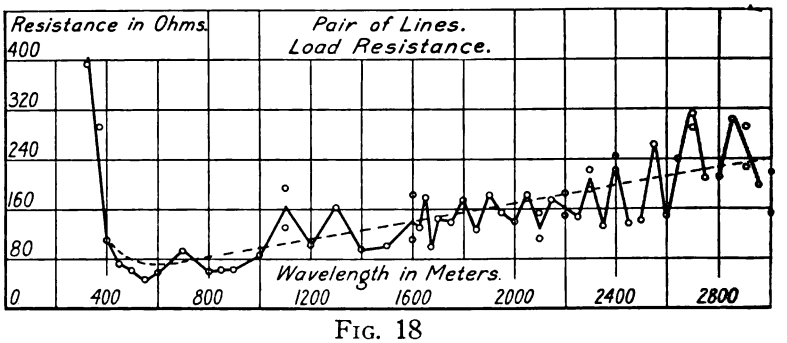

FIG. 18

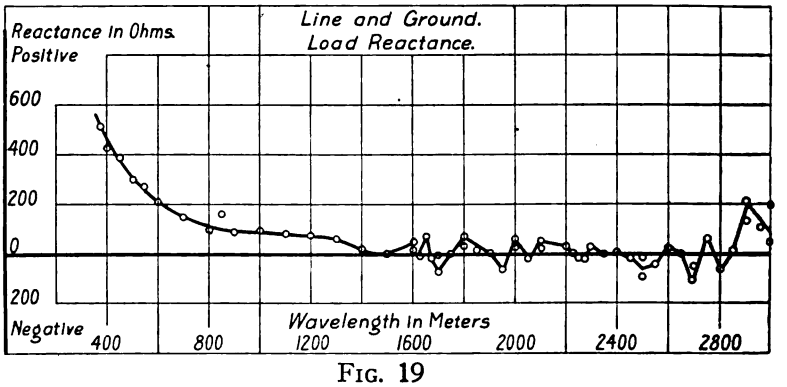

FIG. 19

Telegraph and Telephone Life Insurance Association

Assessment Nos. 695 and 696 have been levied by the Telegraph and Telephone Life Insurance Association, New York, to meet the claims arising from the deaths of Stockton L. Griffin, Veterans' Home, California; Charles S. Waters, Brooklyn, N. Y.; Thomas Henning, Buffalo, N. Y.; Daniel Colestock, Titusville, Pa.; John P. Weigle, New York; George R. Schultz, Fort Myers, Fla.; Charles E. Seaman, Duluth, Minn., and Thomas R. Farrell, Preston, Conn.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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New Radio Device Records Signals Autographically

The feat of recording autographically radio signals from great distances has been accomplished by two Bureau of Standards physicists, at Washington, D. C.—Drs. B. A. Eckhardt and J. C. Karcher—who have demonstrated that their apparatus could take out of the air signals sent out from Lyons, France, 4,000 miles away, and automatically transform them into ink lines on a chart that can be read easily.

They also have been able to place in the same circuit and record with the same pen the ticks of a chronometer and the Naval Observatory time signals that are sent out regularly by Annapolis.

The new device is hailed as the leading apparatus of the day from the standpoint of the astronomer, geographer and surveyor. Scientists have been striving to invent it for the last ten years. With it the longitude of any spot far away from cables and wires can be determined to within two-hundredths second of time or thirty-three feet, it is said. It was to fill that need of an autographic wireless time-recording apparatus to replace the present wire telegraphic ear-recorded methods of making scientific time observations that the Bureau of Standards began its work at the request of the Coast and Geodetic Survey, acting through Major William Bowie.

Because of the relative simplicity and compactness of the apparatus and its ease of operation, it is expected it will find numerous commercial applications, especially in stations that cannot afford a highly trained operator.

"Briefly, this is the way in which the recording is done," said Dr. Eckhardt. "The signal caught by the antennae comes in and starts oscillations in a local circuit, and the starting of the oscillations releases enough local steady current energy to operate a relay, which in turn through another local circuit operates the chronograph pen.

"The chronograph drum moves a sheet of paper past the pen at a uniform rate, and the signals are recorded as sums in the line, short humps for dots and long ones for dashes. By means of a scheme of winding the actuating magnets in different directions, it is possible to record simultaneously with the same pen the seconds of local time as furnished by the local standard chronometer and compare them with standard wireless observatory time without the errors of 'lag' of the instruments.

"Any amateur's receiving equipment properly connected would be sufficient to receive the signals for this apparatus."

The chronographic recording drum used is that developed and in use by the Coast Geodetic Survey. A single electron tube operating on a low voltage furnished by a portable battery is sufficient to receive far-off Lyons, even when a poorly located temporary antennae is used.

In 1921 German scientists were working on the problem of radio time recording which has just been solved by the Bureau of Standards scientists. That problem was a vital one at the International Geodetic Association in Hamburg when the determination of the longitude distance between Europe and America was being considered. An autographic chronographic method of radio had never been perfected, however, although photographic methods which are adapted to use in the laboratory only have been used in scientific work with some success. The new apparatus is compact and not highly complicated, and the Coast Survey will use it in its field work during the coming summer.

Captain G. D. Cowie, of the Survey, is now working with Doctors Eckhardt and Karcher at the Bureau of Standards on the new field sets being made.

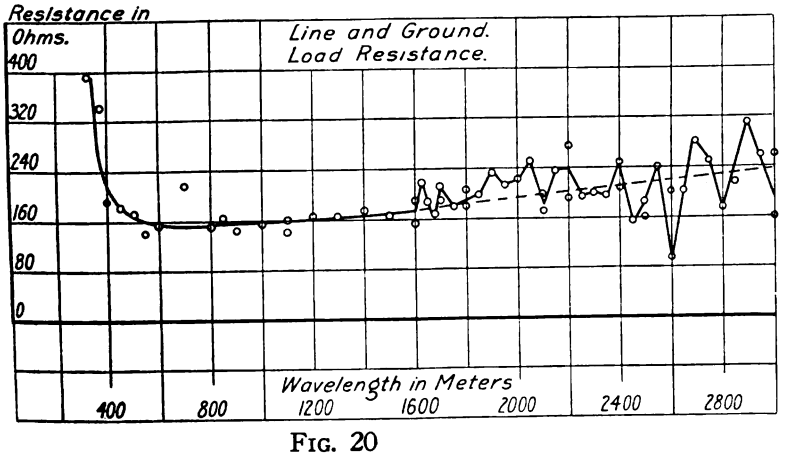

FIG. 20

New Radio Station in Switzerland

The Marconi Wireless Telegraph Company has been authorized by the Swiss Federal Government to construct a wireless telegraph station for operation over a period of twenty-five years by a Swiss company. The station, which is to be erected near Berne, about 1,800 feet above sea level, will employ a Marconi valve continuous wave transmitter of 25 KW capacity, the aerial being carried on two towers, each 300 feet high. Up-to-date apparatus for high-speed automatic working will also be employed. The new station, which will afford special facilities for press traffic, besides conducting a commercial telegraphic service with England and other European countries, will be ready for use by journalists attending the second session of the Assembly of the League of Nations in September next.—*London Electrical Review.*

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Railway Time Service

By H. HULATT, Manager of Telegraphs, Grand Trunk Railway, Montreal

In a previous article, printed in the March 16th issue, the writer briefly outlined the developments in time service work on railroads, and the improvements, as a result thereof, in the grades of watches permitted in train service.

It has, possibly due to an exaggerated conception of the technical problems involved, been the practice of the majority of roads on the North American Continent to place this branch of the service under the supervision of outside individuals or organizations under contract, thereby, probably quite unintentionally but unavoidably, introducing in some cases a commercial aspect in the operation of a railroad department. This has always seemed to the writer to be a very undesirable feature, and one which mitigates against attaining the highest efficiency.

Two notable exceptions to this almost general practice are the Canadian Pacific Railway and the Grand Trunk Railway Systems, which roads maintain their own time service departments, under the supervision of properly appointed officers.

The important thing to realize in time service work is, that you are supervising under strict regulations, particularly in so far as the watch inspection feature is concerned, something the railroad does not own, but, the personal possession of the employee, namely, his watch—consequently to get real co-operation and resultant efficiency it is vital to clear from the mind of the employee any suspicion that the supervisory officers of the time service department benefit in any way, directly or indirectly, from the sale of watches or in the cost of cleaning and repairing same.

In inaugurating a time service system, thought must be given to the following important features:

1. Selection of head of department.
2. Selection of local watch inspectors.
3. System of records.
4. Securing the co-operation of officers and employees.

SELECTION OF HEAD OF DEPARTMENT

Provided the head of the time service department has executive and organizing ability it is not essential that he should be a practical watchmaker—his experts are his local watch inspectors, assuming they are carefully selected, and in all exceptional technical problems submitted to him by his inspectors he can readily secure the willing help and advice, not only of the experts associated with the various watch manufacturers, but also those connected with the Bureau of Standards, and local observatories.

SELECTION OF LOCAL WATCH INSPECTORS

Watch inspectors generally are not remunerated directly by the railroads for their services, due to employees being compelled to regularly visit their stores in order to have their watches approved and subsequently periodically inspected, provided the watch inspector treats the men fairly, he usually secures not only the watch repair business of the employees, but the trade of their families. The inspectors are also given the exclusive privilege of selling watches to employees under deduction orders. In Canada they are also allowed a certain amount of free transportation. In the States, however, under the Hepburn Act, this latter concession cannot be granted to them.

An appointment as a watch inspector undoubtedly adds considerably to the prestige of the watchmaker in his community, and consequently is of value from that viewpoint.

In selecting a watch inspector not only should his technical skill be thoroughly enquired into, and his standing generally in the community, but the head of the department should satisfy himself that if the party is appointed he will, while strictly complying with rules, handle the employees fairly and diplomatically, and assist in educating them to the necessity and value of watch inspection regulations.

In large towns and cities several inspectors should be appointed, so located as to ensure that employees can comply with requirements with the least possible inconvenience.

Frequently the head of the time service department will be asked by a watchmaker, when appointing him a watch inspector, as to what make of watch he should stock, and what he should charge for cleaning and repairing. These are matters on which it is well to avoid possibility of any hint of commercialism, for the official to refrain from giving any ruling, in connection with watches simply telling the watchmaker he can sell to employees any watch complying with standard specifications, and which has been approved for use on the road, (as indicated in the previous article, the products of about thirteen standard manufacturers have been approved by the roads in the United States and Canada, giving employees a choice of between 115 and 120 different grades of watches). Regarding charge for cleaning and repairing, as the men are not under rule compelled to have their watches cleaned or repaired at a watch inspector's, the latter is in competition with other watchmakers; consequently the charge for such work would of necessity have to be governed by such fact. The principal matter is for the watch inspector to ensure good workmanship, and the setting of a standard price for such work by a railroad is not conducive to securing first class repairing and cleaning.

SYSTEM OF RECORDS

Before compiling rules and regulations, issuing circulars, and preparing necessary forms, etc., it is first necessary to determine whether or not it is the intention to operate the time service department under what might be termed the "decentralized" or "centralized" plan.

Under the "decentralized" plan, which is the one

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in effect on practically all roads, the following indicates briefly the routine:

1. Officials having immediate jurisdiction over employees coming under watch inspection regulations (superintendents or trainmasters in the case of conductors, brakemen, yardmen, etc; master mechanics or locomotive foremen in the case of engineers and firemen), assign their men to a certain watch inspector, advising the watch inspector he has done so; the employee is called upon to report to such inspector, and to no other except in case of emergency, or absolute inability to reach such an inspector during a comparison period, in which case he may go to another inspector, and the latter is supposed to notify the man's inspector that he has complied with requirements. Such advices frequently go astray, or arrive too late, resulting in men being incorrectly reported delinquent. The inspectors are obliged to keep records of the men who have complied with requirements, and to report such on their lists as have failed to the official to whom the men report. This system necessitates considerable clerical work on the part of the watch inspector, who is obliged to keep records of the men in a book, and at the end of a comparison period to laboriously go through the same in order to pick out the men who have been delinquent. Due to the numerous changes in original list of employees coming under watch inspection regulations consequent on men leaving the service, being laid off, suspended, etc., and to new men entering the service, unless the inspector is extremely careful his records become incorrect, resulting in much confusion and considerable annoyance to himself, officials and men. Furthermore, the onus of reporting a man delinquent is on the inspector, who thereby is liable to subject one of his customers, and maybe a good one, to discipline. Inspectors are only human, and it is safe to say under this system many men are not reported delinquent when they should be, but allowed to make comparison out of the regular period, or have their rating card fixed up during the next regular period. On some other roads, while the same system of assigning men to a specific inspector is followed, the men are called upon to sign a comparison sheet, which form is at the end of the comparison period turned in by the inspector to the officer to whom the man reports, and by the latter checked.

Inspectors are also called upon to keep records of the time when the watches of the men assigned to them are due for cleaning, and to notify men when such work should be done. This obligation on the part of the inspector to do this is a cause of friction between he and the men, who frequently figure the inspector is trying to secure such work for himself. Although men are allowed to have their watches cleaned and repaired by any watchmaker they may select, their only obligation being to submit for approval to the watch inspector the watch loaned to carry while their own is being attended to. In the interests of efficiency, inspectors should be relieved of the onus of instructing men to have their watches cleaned.

The disadvantages of the "decentralized" plan of operating a time service department are as follows:

1. The fact that watch inspectors are obliged to report delinquents both in so far as making comparison, and cleaning of watches are concerned, thereby incurring the possibility of losing the good will of the men, from whom they secure a part of their business.

2. As to whether or not the regulations are being efficiently observed depends on the personal interest taken in this branch of the service by the superintendents, trainmasters, master mechanics and locomotive foremen. The higher officials of such departments not being furnished with reports from an independent and unbiased source, are unable to be aware of any lack of interest.

3. The head of the time service department, while he may in some cases be furnished with copies of delinquent reports, does not keep in his office records permitting him from same to determine at a glance whether or not any specific employee has complied with requirements (such records usually being kept only in the office of the official having jurisdiction over employees or by the local watch inspector), or to be able to compile detailed statistical information promptly at the end of each comparison period indicating how the regulations have been observed during such period by the men coming under a specific officer, or how the performance on one division compares with that of another.

4. While officers on roads where comparison sheets are turned into them for checking may compile delinquent reports for their own information, if the showing is bad, unless there are specific instructions that copies of such reports go to the head of the time service department, and to the other higher officials, there is no real check as to how efficiently regulations are being observed, and, furthermore, no check as to how correctly the subordinate in office of the officer concerned has compiled such delinquent report.

As a result of these disadvantages, the writer, after having for some years operated a time service department under the "decentralized" plan, evolved and put into effect a "centralized" time service system, and such system is in operation today on the Grand Trunk Railway System, and also on one or two important roads in foreign countries.

(To be continued)

THE Magnet Telegraph was discovered by Morse, the Telephone by Bell, Radio-Activity by Becquerel, Electro-Magnetic Waves by Hertz, X-Rays by Rontgen, the Invention of the Audion by De Forest, and Guided-Wave or High-Frequency Multiplex Telephony and Telegraphy by Squier.

F. E. INGRAM, East St. Louis, Ill., writes: "I take a great interest in the various technical courses, which every telegrapher should read."

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Carrier Current Telephony and Telegraphy

By E. H. COLPITTS and O. B. BLACKWELL

(*Continued in part from page* 151, *April 1st issue*)

Demodulation. By the term "demodulation" is meant the process of reproducing the original low frequency modulating wave from the carrier wave upon which it has been impressed. Various methods of accomplishing this result have been known for many years, such as the use of the electrolytic detector of Pupin or of crystal detectors of various forms. All of these operate by virtue of their non-linear current-voltage characteristics. The instrument which has, however, come to be employed almost exclusively for this purpose is the three-element vacuum tube, and the following discussion presupposes its use.

Because of the bearing of demodulation on the transmission requirements of the system as a whole, we will discuss this matter at some length. Anyone desiring to pursue the matter still further is referred to the publications already cited under "Modulation."

The operation of the demodulating tube is exactly similar to that of the modulating tube, in that if voltages of two different frequencies are applied to its input circuit, there appears in its output circuit a complex current wave. When the output current wave is resolved into its components, we find currents identical with the two frequencies which had been applied to the input, one component whose frequency is the sum of the applied frequencies, one component whose frequency is the difference of the applied frequencies, and a large number of harmonics and sum and difference frequencies. The amplitudes of the two currents whose frequencies are the sum and difference of the applied frequencies are proportional to the product of the amplitudes of the applied voltages. When, therefore, the received modulated wave is applied to the demodulating tube, we may determine the frequencies and relative amplitudes of the components of voice frequency in the output circuit of the demodulator by considering the interaction of the various pairs of frequencies in the modulated wave.

Obviously frequencies in the voice range can occur in the demodulator output circuit only as the difference of two components of the modulated wave. If we subtract the carrier frequency from any component of the upper side band, the result is the original speech frequency which produced that component. The interaction of the carrier and the entire upper side band therefore reproduces all the components of the voice wave with their proper relative amplitudes, since the amplitudes of the side band components are proportional to those of the original voice components, and that of the carrier is the same for all of them. The reproduction of the original voice wave also results from the interaction of the carrier with the lower side band.

It is evident that since speech can be reproduced from either side band alone, there is no necessity for transmitting both. Accordingly, the selective circuits may be so designed as to transmit only one side band. As this effectively halves the range of frequencies assigned to each channel, its great importance is at once obvious.

It is necessary to consider the interactions between the frequency components of the side band itself, for if, in the case of telephony, the voice wave includes components of more than one frequency, each will be represented by a corresponding component in the side band. The interaction of two of these component frequencies, simultaneously present in the side band, gives rise to a component in the output circuit of the demodulator, the frequency of which is the difference between those of the corresponding two components of the original voice wave. Such currents will have a serious effect on the quality of the reproduced speech, if their amplitude is comparable with that of the reproduced voice currents. The amplitude of this distorting component is proportional to the product of the amplitudes of the two side band components, whereas the amplitude of each of the two components of the desired voice current is proportional to the product of the amplitudes of its corresponding side band component and the carrier. The reproduced voice current can be made large compared with the distorting current only by insuring that the carrier is large compared with every component of the side band. As a result of this, it follows that in order to secure good quality it is necessary that the greater portion of the energy applied to the demodulator consist of unmodulated carrier frequency.

The behavior of the receiving apparatus—that is, the demodulating tube—to interfering currents, such as may be produced by induction from external sources of electrical energy, so-called static interference, etc., can be directly deduced from the above considerations. With properly designed selective circuits only those line currents whose frequencies lie in the range of the side band being transmitted can reach the demodulator. These can produce noise of voice frequency either by interaction with the currents normally associated with that channel or by interaction with each other. Unless the interfering currents are of greater amplitude than the carrier current, in which case commercial operation is impossible, the noise components of the greatest amplitude result from the interaction of the interfering currents with the carrier current. The noise current in the output circuit therefore bears the same ratio to the reproduced voice current as the interfering line current does to the side band current. It follows, therefore, that in designing a system it is the side band currents, in which are preserved the characteristics of the speech, which must at all points along the line be kept large compared with the extraneous disturbing currents lying within its range of frequency. This consideration has a very important bearing on the electrical design of apparatus operating on the carrier principle, whether dealing with wire or radio transmission.

While our discussion of modulation and demodu-

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lation has been made as concise as possible, it is evident from the foregoing that these two are complementary processes. Modulation may be thought of as elevating the band of essential speech frequencies to a position adjacent to the carrier frequency, and demodulation may be regarded as the process of restoring this band to its normal position in the frequency scale.

(To be continued)

The Emancipation Proclamation

The Emancipation Proclamation which set the negro free was drafted by Abraham Lincoln, at an ordinary table in the telegraph office of the War Department, and no attempt was made by him to keep it a profound secret, said I. D. Maize, one of Philadelphia's veteran telegraphers, in a recent address.

Mr. Maize was a military telegraph operator during the Civil War, stationed in and near Washington, and came into frequent personal contact with President Lincoln.

"Mr. Lincoln passed much of his time at the War Department," said Mr. Maize, "and one day while sitting at an ordinary table there, in a room through which officials often passed and to which all the telegraph operators had access, he wrote the Proclamation. He would write a few sentences, then, if called away, would shove the paper into a drawer among telegraph blanks, where we all could, and did, see it; but we kept the secret."

Mr. Maize related an incident of the early days of the war when he was stationed near the Capital with the command under General "Baldy" Smith. A soldier was found asleep at his post, taken before a court-martial, and sentenced to be shot next morning. It was the first incident of the kind in the war, and efforts were made to obtain clemency from Lincoln. The President sent a full pardon; then, to make sure it reached its destination, visited the camp accompanied by his entire cabinet. Assured by General Smith the pardon for the soldier, whose name was Scott, had arrived, he asked if the man had been told. The General replied that he had not.

"Well," said the President, "don't tell Scotty until the time for the execution arrives." Then, in high spirits, he began to tell some of his stories.

The next day "Scotty" was led to the place of execution and seated upon a coffin beside an open grave. General Smith drew from his pocket what all thought was the order for the execution. It was the pardon. Discipline went by the board at once, the soldiers cut loose in a mad revel and expressed their joy.

Mr. Maize is still active in telegraph circles and works for the Western Union Telegraph Company in the main office in Philadelphia.

F. KING VREELAND, the well-known expert in radio telegraphy, is perfecting a device that it is stated will prevent interference in radio signals. He is conducting his experiments at the Stephens Institute of Technology, Hoboken, N. J.

Vaudeville by Radio Telephony

Audiences in selected cities of Ohio, Illinois and Arkansas and the District of Columbia listened on March 13th to a reproduction by radio telephone of a vaudeville programme in the home of Robert F. Gowen, chief engineer of the De Forest Radio Telephone and Telegraph Company, at Ossining, N. Y. It was the first demonstration of musical transmission by wireless telephone. An orchestra played several selections, the Duncan Sisters sang, and there were instrumental numbers and a monologue.

Dr. Lee De Forest and a party of friends were present at the entertainment. The performers stood near a big sounding board which carried their voices to an amplifier, thence to the radio transmitter and to the aerial. Mr. Gowen announced at the end of the performance that the stations sharing in the demonstration had reported they had heard the programme clearly.

The receiving stations were at Chicago, where R. H. G. Matthews, chief engineer of the Chicago Radio Laboratory, had invited guests to hear the New York vaudeville artists; at the home of the Rev. J. A. Manning, in Salem, Ohio; by Charles Candler and his guests at St. Mary's, Ohio; the Naval Radio Research laboratories in Washington, D. C.; and by John Clayton and his guests at Little Rock, Ark.

Mr. Matthews relayed the wireless currents to Colorado Springs, Colo.

German Wireless Telegraphy

The German wireless services are of three kinds —the international, the home, and the special. The stations at Nauen and Eilvese afford communication with overseas countries, and that at König-Westerhaus with European countries. The home service is catered for by 15 stations, besides 15 coastal stations for communication with shipping. The Nauen station has lately undergone considerable modifications, with a view to facilitate the service with America. At present duplex communication has been set up between Nauen and the Radio Corporation station at Marion, Mass., and transmission is made simultaneously in the two directions. The Marion messages are not received at Nauen itself, but at Geltow, near Potsdam, and 10,000 words per day are sent, but this number might be fourfolded. Nauen is able to transmit 24,000 words per day. The transmission plant consists of two high frequency machines, each of a capacity of 500 KW, and a small 200-KW machine, with corresponding transformers. There are two antennae, entirely distinct. It is in contemplation to double the plant, with the object of providing a separate service to South America.

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY.

By Louis Casper.

Lesson 25

Before entering into a discussion of methods of duplex operation, whether it be Morse or automatic, it would be well to take up briefly a study of the constitution of an electric circuit together with an elementary exposition of alternating current phenomena, insofar as it relates to the telegraph.

A circuit represents the entire path along which the electric current is supposed to flow. In the case of a telegraph circuit, this path usually includes the earth, together with a series of wire, or other metallic conductors, all of which must be united as a whole in order that any electrical action may develop. It is then known as a "closed" circuit, forming a sort of irregular circle, closed loop or endless path for the current to circulate. A disconnection at any point of this arrangement would constitute an "open" or broken circuit.

The primary battery and the conducting wire connected therewith represents a continuous path for electrical action. The generator with its outer circuit does the same. A telegraph system using the earth alone or in part for the return circuit is regarded as an electric circuit. The earth is taken as representing a conductor, although its function may not be strictly regarded as such.

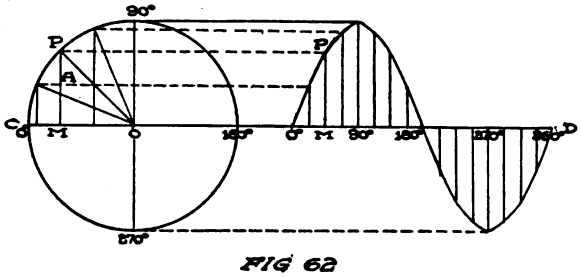

FIG 62

In a telegraph circuit operated on the duplex principle, the method of operation is attained by transmitting currents in alternate directions and utilizing a polarized relay for the reception of these current alternations.

By reason of this fact, such a circuit takes on some of the characteristics involved in alternating current working.

An alternating current is one which reverses its polarity regularly, or it may alternate in a variable manner in obedience to telegraph signals in transmission on a polar duplex circuit. It starts from the zero value and rises to a maximum of one polarity, then descends to the zero point, where it changes in direction, after which it reaches the maximum of opposite polarity, whence it returns to zero again.

The changes just described constitute a cycle of alternating electromotive force. If for the word "polarity" we substittue the word "direction," the sentence will describe a cycle or wave of alternating current. When a wave of alternating current reaches its point of greatest value, the whole circuit is animated; when it reaches zero value the whole circuit is at zero. The expression wave must be clearly understood. It does not mean that waves run over the circuit, but that the current flowing along the whole circuit passes through the values of the cycle, ranging from zero to a maximum of one direction and back again to zero to a maximum in the opposite direction, then returning to zero, thus completing a wave. The number of waves per second as described represents the frequency of the alternating current.

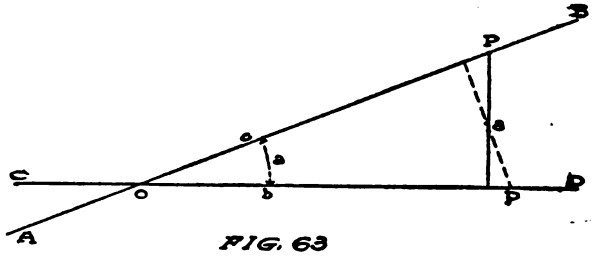

FIG. 63

In order to further illustrate the form of an alternate current wave or cycle, we will picture a line representing the cross-section of a wave such as is shown in Fig. 62. The horizontal line CD is known as the locus (place) of zero values. The vertical lines are drawn of length corresponding to the distance of points of the curve from the horizontal or base line. They are called ordinates of the curve. The curve comprises one full wave or cycle.

The section above the horizontal line represents the electromtotive force of one polarity and the section below the line that of the opposite polarity. The lengths of the ordinates indicate the values of the electromotive force at a particular instant of time. The shape of the curve represents the manner in which the electromotive force increases and diminishes.

The curve as shown is known in terms of trigonometry as the sine wave.

It is not within the province of these lessons to exemplify the principles of trigonometry in any detail, and the student is urged to familiarize himself with the fundamentals of this study in order to obtain a clear understanding of the subject under discussion, which is quite important, especially in the consideration of current values in automatic telegraph operation.

A brief explanation, however, will be made of the elementary principles of trigonometry in so far as they relate to the theory of the laying out of sine curves.

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Trigonometry

Trigonometry is the science of angles; its province is to teach us how to measure and employ angles with the same ease that we handle lengths and areas.

An essential in the study of alternating currents is the ability to recognize and measure angles.

An angle is the opening or the divergence between two intersecting lines AB and CD (Fig. 63). A method of measuring angles may be made by employing degrees, a complete circle being 360°. In many instances the student in this especial study would find that the mere use of degrees would be meaningless. It is then that certain constants connected with the angle, called its functions, must be resorted to. Suppose we have an angle as shown in Fig. 63. We may choose a point anywhere either on the line AB or CD; for instance, the point P. From P drop a line which will be perpendicular to CD. This gives us a right-angle triangle whose sides we may call a, b, c, respectively. We may now define the following functions of the angle:

$$\text{Sine} = \frac{a}{c}$$

$$\text{Cosine} = \frac{b}{c}$$

$$\text{Tangent} = \frac{a}{b}$$

which means that the sine of an angle is obtained by dividing the perpendicular a (or the opposite side) by the hypothenuse OP, the cosine, by dividing the base b (or the side adjacent to it) by the hypothenuse; and the tangent by dividing the side opposite (a) by the side adjacent (b).

These values, sine, cosine, tangent, are, therefore, nothing but ratios—pure numbers, and under no circumstances should be taken for anything else.

Looking at Fig. 63 it is evident that no matter where we choose P, the values of the sine, cosine, and tangent will be the same; for if we move P farther out on the line we will increase c, but at the same time a will increase in the same proportion, the quotient of a divided by c being always the same wherever P may be located.

Likewise b divided by c and a divided by b will always remain constant. The sine, cosine and tangent are, therefore, always fixed and constant quantities for any given angle. It may be said that if P had been located on the line CD and the perpendicular drawn to AB, as shown by the dotted lines (Fig. 63), the hypothenuse and adjacent side simply exchange places, but the value of the sine, cosine and tangent of any angle remains the same at all times, they become convenient terms for employing the angle.

Referring again to Fig. 62, this figure is shown to represent the sine curve, or curve of sines, as it is called. In further description of this figure we may add the following principles: On a horizontal line CP are erected perpendiculars. This line is divided into 360 parts, representing degrees of a circle. Each perpendicular is laid off equal in length to the sine of the angle expressed by the degree mark on which it stands. Up to the 180th division the perpendiculars are on one side of the base line; for the rest of the 360 divisions they are below it. At one end of the horizontal zero line is a circle with its center on the line CD. Sines of various angles are drawn, and from the end of each sine a horizontal line is drawn, under or over the zero line, according to the position of the sines. For each angle sines are drawn, such as A between M and P. On the base line divisions corresponding to the angles are laid off and ordinates erected on them. Each sine determines the length of the ordinate corresponding to its angle. Thus, the sine A of 45° determines the length of the ordinate MP erected on the second or 45° of the sixteen divisions of the horizontal base line CD.

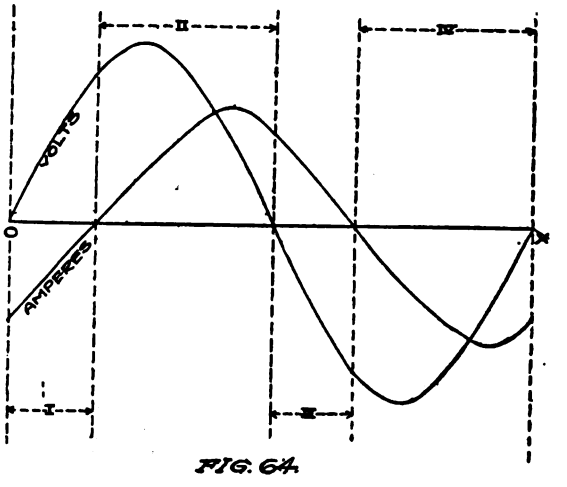

FIG. 64.

Alternating Electromotive Force and Current Curves

When an alternating electromotive force is producing a current, separate curves may be drawn for each (Fig. 64). One zero or base line is used for both curves. The portions of the electromotive force curve above the line represent the portions of the electromotive force producing current represented by the portions of the current curve above the line. The same applies to the curves below the line. The length of a wave of current must be rigorously equal to that of a wave of electromotive force producing it. The height of the curve may be different and as a matter of convenience usually is so drawn. The figure shows two small waves. The current (amperes) curve may cross the zero line at the same points when the electromotive force does, or may not, according to the condition of the circuit.

The next lesson will deal with the differences in an alternating current circuit of electromotive force and current values flowing through the same, together with the counter forces that produce such differences.

(To be continued)

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EDITORIAL COMMENT

Ownership Statement

Statement of the ownership, management, circulation, etc., required by the Act of Congress, of August 24, 1912, of TELEGRAPH AND TELEPHONE AGE, published 1st and 16th days of each month at New York, N. Y., for April 1, 1921.

State of New York,
County of New York,
ss.

Before me, a notary public in and for the State and county aforesaid, personally appeared John B. Taltavall, who, having been duly sworn according to law, deposes and says that he is the publisher of THE TELEGRAPH AND TELEPHONE AGE and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, John B. Taltavall, 253 Broadway, New York.
Editor, John B. Taltavall, 253 Broadway, New York.
Managing Editor, none.
Business Managers, none.

2. That the owner is:

John B. Taltavall, 253 Broadway, New York.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities, are:

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

JOHN B. TALTAVALL, Publisher.

Sworn to and subscribed before me this 17th day of March, 1921.

[SEAL] JOSEPH R. FRITH.

(My commission expires March 30, 1922).

Notary Public, Kings County, No. 79.
Certificate filed in New York County, No. 182.
Kings County Register's No. 2078.
New York County Register's No. 2163.

President Harding on Radio and Cables

President Harding in his message to Congress on April 12th had this to say:

"It is proper to invite your attention to the importance of the question of radio communication and cables. To meet strategic, commercial and political needs, active encouragement should be given to the extension of American-owned and operated cable and radio services. Between the United States and its possessions there should be ample communication facilities providing direct services at reasonable rates. Between the United States and other countries not only should there be adequate facilities, but these should be, so far as practicable, direct and free from foreign intermediation.

Friendly co-operation should be extended to international efforts aimed at encouraging improvement of international communication facilities and designed to further the exchange of messages. Private monopolies tending to prevent the development of needed facilities should be prohibited. Government owned facilities, wherever possible, without unduly interfering with private enterprise or government needs, should be made available for general uses.

Particularly desirable is the provision of ample cable and radio services at reasonable rates for the transmission of press matter, so that the American reader may receive a wide range of news and the foreign reader receive full accounts of American activities. The daily press of all countries may well be put in position to contribute to international understandings by the publication of interesting foreign news."

International Communications Conference

While resignations of Admiral Benson and former Postmaster-General Burleson as American Commissioners to the International Communications Conference have been accepted by President Harding, it is announced only one vacancy remains to be filled.

As now constituted, the American Commission is composed of Under Secretary Fletcher, of the State Department; Norman H. Davis, former Under Secretary, who has been induced to remain, temporarily, and Walter S. Rogers, appointed by President Wilson.

President Harding's Voice on Phone Heard 5,700 Miles Off

The greatest span ever covered by the human voice was achieved on April 11th during the ceremony in which President Harding formally opened telephonic communication between the United States and Cuba.

A conversation took place via wireless telephone, land and sea telephone cables from Catalina Island, off the California coast, to Cuba, a distance of 5,700 miles.

President Harding in his greeting to President Menocal said that the United States would always strive to prove the tried and helpful friend of Cuba.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

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Be sure they're on the next requisition.

The Diaphragm Sounder records Morse signals with remarkable distinctness. There is no uncertainty, no sputtering, no lost motion of any kind. When the relay works the sounder works—that's all there is to it.

Diaphragm Sounders are extensively used in line offices, and give better service, longer—and at less expense than any other type of sounder.

Telegraph engineers on more than 100 Railroads, Pipe Lines and Oil Companies are making good use of these dependable, money-saving sounders, why not you? Be sure they're on the next requisition. Fit any relay.

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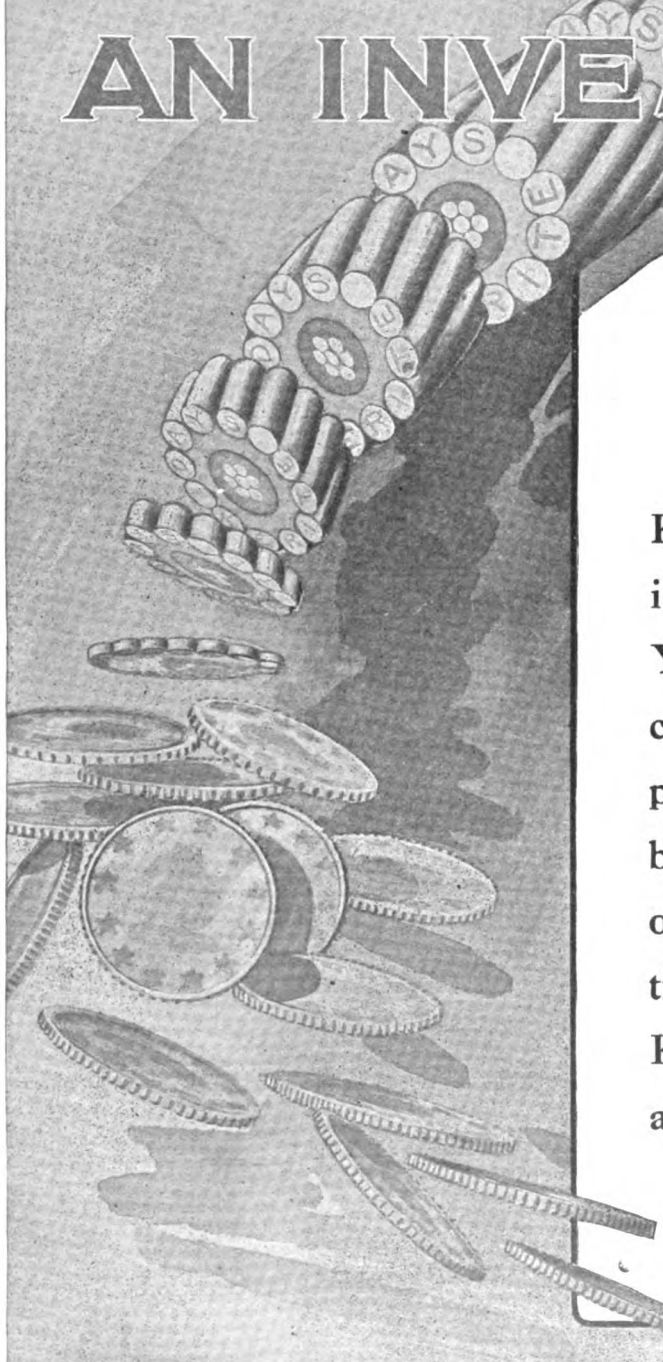

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THE RAILROAD

Chicago Meeting of the Telegraph and Telephone Section of the American Railway Association

The Committee of Direction of the Telegraph and Telephone Section of the American Railway Association met in Chicago on April 6th, the following members being present: H. Hulatt, Montreal, chairman; W. H. Hall, Denison, Texas; R. F. Finley, Cleveland; E. A. Chenery, St. Louis; E. E. Dildine, St. Paul, Minn.; G. D. Hood, Chicago; C. S. Rhodes, Indianapolis, Ind.; E. C. Keenan, New York; G. A. Cellar, Philadelphia, and W. A. Fairbanks, secretary, New York.

The session lasted all day and considerable busiwas disposed of.

J. B. MacGregor, assistant superintendent of telegraph, Grand Trunk Railway System, Battle Creek, Mich.; M. R. Greenamyer, of the Pennsylvania System, Pittsburgh, and Stanley Rhodes, telegraph and telephone engineer, New York Central Lines, New York, were appointed members of Committee No. 1—Construction and Maintenance —Outside Plant.

S. L. Van Akin, of Chicago, was appointed a member of Committee No. 5—Telegraph and Telephone Development, and also vice-chairman of that committee.

G. W. Jett, superintendent of telegraph, Norfolk and Western Railroad, Roanoke, Va., and A. W. Copley, general engineer, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., were appointed members of Committee No. 7—Inductive Interference.

C. E. Baxter, telegraph engineer, Michigan Central Railroad, Detroit, and B. F. Thompson, telephone engineer, Baltimore and Ohio Railroad, Baltimore, were appointed members of Committee No. 11—Telephone Transmission.

M. C. Rypinski, radio sales manager, Westinghouse Electric and Manufacturing Company, Pittsburgh, and A. H. Armstrong, chairman Electrification Committe, General Electric Company, Schenectady, N. Y., were appointed members of Committee No. 12—Radio and Wired Wireless.

J. P. O'Donohue, assistant chief engineer, Postal Telegraph-Cable Company, New York, was appointed a member of Committee No. 2—Construction and Maintenance—Inside Plant.

H. Hulatt, of the Grand Trunk System, Montreal, was appointed representative for Canada to keep Sub-committee B—Wire Crossings—informed on wire crossing legislation proposed in the Dominion.

The Hotel Cleveland, Cleveland, Ohio, has been selected as headquarters for the September annual meeting.

The Various Committees of the Telegraph and Telephone Section of the American Railway Association

The Telegraph and Telephone Section of the American Railway Association through its various committees is accomplishing a great deal of efficient work in connection with the subjects referred to them. The names of the chairmen, together with the titles of the committees, are as follows:

Committee of Direction—H. Hulatt, chairman. Committee of Nominations—H. C. Chace, chairman. Committee No. 1—Construction and Maintenance—Outside Plant—G. A. Cellar, chairman. Sub-Committee "A"—Construction and Maintenance of Pole Lines—E. C. Keenan, chairman. Sub-Committee "B"—Wire Crossings—H. A. Shepard, chairman. Sub-Committee "C"—Underground Construction—C. A. Plumly, chairman. Sub-Committee "D"—Transpositions—G. A. Dornberg, chairman. Committee No. 2—Construction and Maintenance—Inside Plant—R. F. Finley, chairman. Sub-Committee "G"—Apparatus and Material—G. K. Stewart, chairman. Sub-Committee "H"—Locations and Layouts—C. A. Worst, chairman. Sub-Committee "J"—Circuits and Current Supply—W. Rogers, chairman. Sub-Committee "K"—Installation and Maintenance—J. L. Niesse, chairman. Committee No. 3—Protection Against Electrolysis—B. J. Schwendt, chairman. Committee No. 4—Protection Against Lightning or Electric Light and Power Circuits—J. F. Caskey, chairman. Committee No. 5—Telegraph and Telephone Development—J. A. Jones, chairman. Committee No. 6—Message Traffic—G. D. Hood, chairman. Committee No. 7—Inductive Interference—L. Behner, chairman. Committee No. 8—Editing —W. A. Fairbanks, chairman. Committee No. 9—Future Activities and Topics—W. H. Hall, chairman. Committee No. 10—Technical Training—I. C. Forshee, chairman. Committee No. 11—Telephone Transmission—Stanley Rhoads, chairman. Committee No. 12—Radio and Wired Wireless—J. D. Jones, chairman, and Committee No. 13—Arrangements—R F. Finley, chairman.

Industrial

Diaphragm Telegraph Sounders

The Diaphragm telegraph sounders, which are in common use in all sections of the United States and in many foreign countries, continue to give satisfaction to the purchasers and to those interests who have adopted them for practical purposes. The fact that these sounders are used by more than one hundred Railroads, Pipe Lines and Oil Companies speaks volumes for their efficiency. Write for printed matter to Railways Labor Saving Device Company, 1108 Arlington Avenue, Davenport, Iowa.

The Jester-Cooper Repeater

Telegraph engineers are requested to note the fact that J-C Repeaters, which are advertised in another column, have after five years of service proven beyond question their dependability under all operating conditions. Write to the Jester-Cooper Company, P. O. Box 924, Houston, Texas, for descriptive literature.

THE franchise of the Direct West India Company was recently extended for another twenty years.

WORK is the stepping stone to prosperity.

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The New President of the Old-Time Telegraphers

At a meeting of Old Time Telegraphers and Historical Association held at Richmond, Va., on March 26th, General Jo. Lane Stern was elected president, to succeed the late Charles W. Bradley. General Stern is adjutant general of the State of Virginia, with headquarters at Richmond.

He was born at Ruther Glen, Caroline County, Va., December 23, 1848. He first entered the telegraph service at Chesterfield Station, Va., in 1862. This was during the Civil War. At its close Mr. Stern attended Washington College for four years, of which General Robert E. Lee was president, and graduated in 1870 as Batchelor of Law. General Stern has been practicing law in Richmond, Va., since 1871. He has been in military service since April 12, 1871, filling positions from private in the First Regiment to that of present position occupied by him as adjutant general of the State.

General Stern began his telegraph career during the first year of the Civil War, in 1861, at Military and Railroads Stations, Chesterfield Station, Va., when just thirteen years of age. In 1862 he assisted operators along the line of the Richmond, Fredericksburg and Potomac Railroad from Ashland to Hamiltons Crossing. In 1863 he was taken into the service of the Confederate States as military telegraph operator, and served with the cavalry of the Army of Northern Virginia at several stations with that army, and from May 23, 1864, until about September, 1864, at the main office of Confederate States Military Telegraph, 11th Street, Richmond. He was then ordered back to Hamiltons Crossings, and served for some time along the line of the Richmond, Fredericksburg and Potomac Railroad with several commanding officers until the fall of Richmond, April 3, 1865. He was then ordered to Lynchburg to join the Army of Northern Virginia, but the army surrendered on April 9, 1865, and General Stern surrendered at Richmond, May 2, 1865, and was paroled.

General Stern when elected president of the Association stated: "You know that I am starting in by putting very old wine into new bottles, about which I am not informed, but if devotion to the memory of old days will amount to anything, you can count on me."

The selection of General Stern as the standard bearer for 1921 has been enthusiastically received by Old Timers in the Southland.

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Western Union Telegraph Company's Annual Report

A thorough history of the controversy between the Western Union Telegraph Company and the United States Government over the landing of the Barbados cable off the coast of Florida, which was prevented by American ships of war, is the feature of the annual report of the company, just made public. The company explains the steps by which the contract with the Western Telegraph Company, a British corporation, was made, and asserts that not until a $3,000,000 order for cable had been placed and the actual work of laying the line of communication began did the Government display any interest in the matter. Letters to the State Department, it declares, went unanswered. The report denies that messages over the cable would be subject to British espionage.

"Additional cable communications are essential to the development of our international commerce," the statement goes on, "for which we have been building an American merchant marine, and careful study with a view of improving cable facilities shows clearly that only by connecting with established telegraph systems overseas can American connecting cables meet the requirements of American business and of American news.

The report showed that during the year the company had increased its net income, after all charges and taxes, from $10,635,387, or $10.65 a share on its capital stock in 1919, to $12,785,722, to $12.81 a share on that stock in the year just ended. Its gross income for 1920 was nearly double that of 1919. The following table gives the chief items of the income account for 1920, compared with the same items of the preceding year:

	1920	1919
Gross operating revenue	$119,991,825	$55,308,639
Other income	1,481,860	1,606,523
Compensation from U. S. Government		5,184,298
Gross income	121,473,685	62,099,460
Operating exp. inc. depreciation and taxes	106,838,713	48,460,865
Interest, &c.	1,849,250	1,178,208
Cable depreciation, res.		1,825,000
Net income	12,785,722	10,635,387
Dividends	6,982,538	6,982,472
Surplus	5,803,184	3,652,915
Adjustments, &c.	166,556	1,456,439
Total surplus	40,685,210	34,715,470

"Government business," the report points out, "was handled at $1,900,000 less than cost of operation. Gross receipts would have been $2,500,000 greater had commercial rates been received. While the volume of Government messages substantially declined during the year, yet, prior to the war, Government business at Government rates averaged only $500,000 annually. The company purposes renewing efforts to have the Government rate fixed to at least par for cost of operation.

At the close of the year there were 23,911 stockholders, an increase of 1,248 over 1919. Of the total number, 16,711 held twenty-five shares or less and 22,182 held 100 shares or less.

"Many important improvements have been made to strengthen the cable system. By the use of magnifiers and other improved types of apparatus the speed of signalling over the ocean cables has been appreciably increased and a printing telegraph apparatus has been developed and successfully operated. The report says that the further development of wireless should materially help the expansion of trade and commerce and thus increase the volume of cable traffic."

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The New York Telegraphers' Aid Society

The annual election of the New York Telegraphers' Aid Society was held on March 29th at 24 Walker street, and resulted as follows:

President, C. J. Lemaire; vice-president, J. J. Keefe; treasurer, T. M. Brennan; financial secretary, C. A. Kilfoyle; recording secretary, Mary E. Saunders; Executive Committee—A. M. Lewis, F. X. O'Connor, R. J. Marrin and A. F. Kavanaugh; auditors—F. J. Nurnberg, J. F. E. Hopkins and H. M. Heffner.

The annual statement of the society for the year ended March 6th shows a balance of $23,057.06
Receipts 5,378.87

Total $28,435.93

Disbursements:

Sick benefits	$3,252.00	
Death benefits	1,100.00	
Expenses	838.07	
		5,190.07
Balance on hand		23,245.86
Total		$28,435.93

RELIEF FUND

Balance on hand March 6th	$7,032.01
Receipts	791.06
Total	$7,823.07
Disbursements	396.50
Balance on hand March 6th	7,426.57
Total	$7,823.07

The Electrical Aid Society of Philadelphia

The concert and dance of the Electrical Aid Society of Philadelphia was held on March 31st at Mercantile Hall. Over one thousand members and their friends occupied the dance floor until 1.30 A. M. That the affair was a great success was attested by the sale of tickets and wardrobe checks.

The amount realized from these affairs is given over to the trustees for investment in the Relief Fund. This fund was created some years ago for the purpose of assisting members, who, by reason of misfortune, may be compelled to seek aid from the money loan sharks. Much good has resulted, and the loan sharks have been driven from our midst.

An interesting talk was indulged in by President John A. Chapman, included in which was the Relief Fund, which has grown from a small donation to its present size. He also called attention to the fact that this society was proud of being able to provide a last resting place for the knights of the "key" and the "hello" operator. The sum of $2,000 was directed by the Executive Committee to be paid the trustees for the purpose of investing in new United States Government Bonds of Indebtedness.

The boxes at Mercantile Hall were occupied by the following named past presidents and their families: Frank E. Maize, five years; Andrew S. Weir, five years; A. G. Strickland, three years; Charles A. Huver, three years; and the present incumbent, Mr. Chapman, in his second year.

Philadelphia

MUCH interest has been manifested in the diary of the always popular J. Frank Howell, of New York, a copy of which has just been received here, and which contains more than ten thousand words concerning his doing on his recent trip to South America. Frank is some traveler, and, more than that, one of the finest exponents of Morse and a prince of good fellows!

THE Dot and Dash Club of Philadelphia promises one of the biggest of times at its next dinner, to be held on Thursday, May 5th, at the Hotel Loraine, Broad Street and Fairmount Avenue, Philadelphia. If you are not there you will be missed and will miss the enjoyment of the association of Philadelphia's hospitality. Inquiries have been received from Messrs. "Denny" Brown and Frank Kane, of Washington. "Denny" and his Irish wit alone will be well worth a trp to the Quaker City. Louis C. Derrick, who commutes between Philadelphia and Washington, is "Denny's" press agent.

Obituary

JOSEPH W. BOYD, aged eighty-two years, a veteran telegrapher of the Civil War, died at Beaver, Pa., on March 27th. Mr. Boyd served as a telegrapher during the entire Civil War, and was promoted to the rank of major. After hostilities ceased he returned to Pittsburgh, and for many years was a well-known contractor in that city. He retired from active business eight years ago, since which time he had lived in Beaver, Pa.

HENRY H. ATWATER, aged eighty-one years, a member of the United States Military Telegraph Corps of the Civil War, died at this home in Brooklyn, N. Y., on March 27th. Mr. Atwater served with distinction in the Military Telegraph Corps during the Civil War, and for years afterwards was in the employ of the Western Union Telegraph Company as manager of the dry goods district in New York. For the last ten years he has conducted a photographic business in Brooklyn.

THOMAS BENJAMIN DOOLITTLE, aged eighty-two years, of Branford, Conn., pioneer telephone engineer, one of the originators of the telephone switchboard and the inventor of hard drawn copper wire, and associated in the organization of the original Bell Telephone Company, died in Boston on April 3rd. Mr. Doolittle was born in Woodbury, Conn. He retired from active service with the American Telephone and Telegraph Company in June, 1919.

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Dyke's Automatic Electric Buoy Lamp

Since the repair of the first submarine telegraph cable, the need of adequate means of illumination for mark buoys during night operation has been felt by all repairing ships. At the present time the original type of oil lamp, with a few improvements, is still in use and is far from satisfactory, owing to the following defects, which appear to be hard to overcome. The average hours of burning without retrimming is between twenty-four and sixty hours, which necessitates the lamps being renewed every second day. As mark buoys are generally about seven miles apart on deep water repairs, and the number in use at one time varies from two to four, the amount of time taken up every two days in steaming round these buoys to renew the lamps and the cost of the fuel thus expended amounts to a very considerable item on a long deep water repair. During high winds the lamp glasses become smoked up, thus obscuring the light and very frequently blow out entirely. This causes the ship to lose the buoy, and as this generally occurs during a gale she may drift many miles away from her position, and if conditions are unsatisfactory for obtaining observations it may be days before she is able to return to the buoy. If the oil lamps receive a fairly heavy jar during the operation of lowering the buoy over the ship's side, they generally go out, which necessitates lowering a boat to renew them, which is not always desirable in rough weather. With these defects in mind the writer has brought out an automatic electric buoy lamp, which was patented in the United States of America, August, 1919. In the design of such a lamp there were many points to consider and obstacles to overcome, as it was considered necessary that the lamp should fulfill the following requirements to be satisfactory in operation:

(A) It should burn for at least ten days.

(B) Its weight and size should be approximately the same as an oil lamp.

(C) It should be inexpensive to operate.

(D) It should be mechanically strong and watertight.

(E) Its necessary renewals should be obtained at any port.

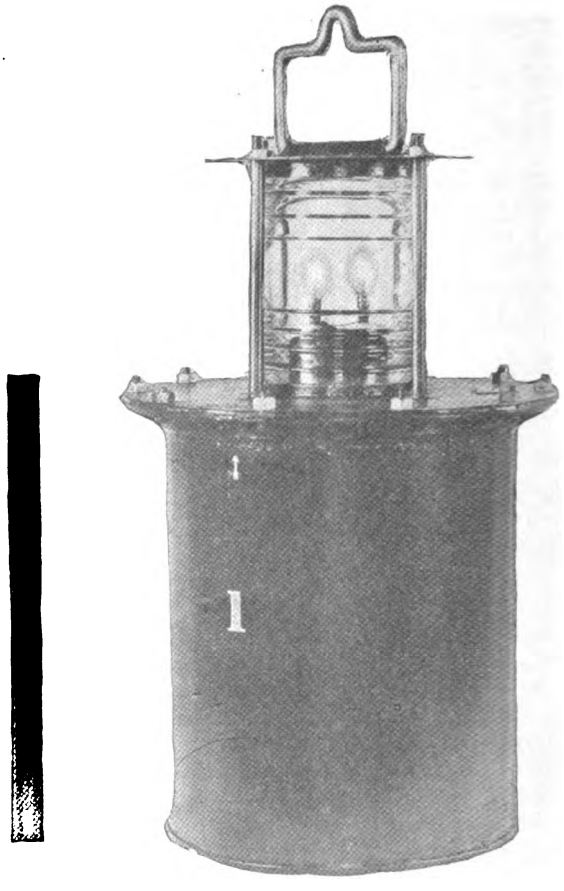
(F) Its first cost should not be excessive.

The question of using either storage batteries or dry cells as the source of power was considered at some lengths, and it was decided that to fulfill the requirements of light weight and low first cost, the dry cell was the more suitable. Also from an operating viewpoint under such adverse conditions as would be found on a cable buoy in rough weather, the storage battery was considered unsuitable.

The following is a description of the writer's lamp, and also its method of operation:

The lower part of the lamp consists of a circular galvanized sheet iron can, 9 inches in diameter and 11⅛ inches in height, the upper edge of which is fitted with a cast brass flange ring securely rivetted and soldered to the can. The top of the can is fitted with a galvanized iron closure plate, which is bolted to the flange ring with ten one-quarter-inch brass bolts spaced around the circumference of the ring, a rubber gasket being used to make the junction watertight.

The closure plate contains a 3⅜-inch opening in its centre, around the upper edge of which is soldered a small metal collar, which holds a 4-inch diameter circular dioptric lense 5¾ inches high. A second closure plate, having a similar metal collar on its under side covers the top of the lense, rubber gaskets being used to make the junction of the lense and the closure plates watertight. The upper closure plate is bolted firmly to the lower closure plate by four brass rods, the ends of which are threaded and project through holes in the upper and lower plate, and are held in place by brass lock nuts. The upper closure plate carries a brass handle on its upper side, held in place by a strap rivetted to the plate. The galvanized iron can contains a circular wooden carrier built on a hardwood base 8⅞ inches in diameter, having four shaped posts spaced around its circumference, the posts being 10⅞ inches high, and have around their upper ends a circular brass ring for lifting the carrier. In the centre of the base is placed a wooden block 5 inches high, having a centre hole 2⅝ inches in diameter, the outside circumference of which is fluted to allow seven dry cells to fit around it. The eighth dry cell fits into the center hole of the wooden block. Immediately above the



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dry cells is fitted a circular shelf resting on shoulders cut in the four posts. This shelf carries clock or timing mechanism. The wooden carrier supporting the eight dry cells and the clock is removable from the can. The centre hole in the lower closure plate is fitted with a circular wooden block having a flange on its lower end, held in place by a brass strap screwed to the block, having a hole in each end of the strap, which fits over the projecting ends of two of the brass rods connecting the upper and lower closure plates. The strap is held in place by lock-nuts. The upper end of the block carries two minature porcelain lamp holders to take the small screw base lamps, the two holders being wired in parallel, the main leads being carried down through two holes in the block, to the timing mechanism and batteries. The timing mechanism consists of an eight-day clock, the gearing of which is so constructed that the arbor of the clock revolves once in twenty-four hours. This arbor is provided with an integral collar constituting an abutment for the timing disc, which is made of insulating material, and is secured in position on the arbor by a wing nut. The face of the disc is divided into twenty-four hours, the numbering of the divisions being in two groups of twelve hours each. A portion of the periphery of the disc is slightly cut away and a segmental metal contact plate inset. The length of this contact plate depends on the number of hours the light is required to burn each night. If the light is required to burn for eight hours each night, such as would be required during summer nights, the disc is made having the contact plate inset from the division marked 8 P. M. to the division marked 4 A. M. For winter operation a disc is provided to give twelve or fourteen hours' light. A pair of spaced spring contact fingers mounted on a small insulating block are mounted on the frame of the clock at the side of the disc. The ends of these contact fingers rest firmly on the periphery of the disc, connections being made to the fingers by two small terminals. The tips of the contact fingers and also the segmental contact piece in the disc are gold plated to prevent corrosion by the sea air and to give as perfect a contact as possible. The eight dry cells are connected in series parallel to give 5 to 6 volts, the lamps being 5.5 volts, taking .30 amperes each. One pole of the battery is connected by a flexible conductor direct to the lamps, while the other pole is connected to one of the terminals, on the block carrying the contact fingers, the other terminal being connected to the lamps.

The method of operation is as follows:

Assuming that an eight-hour disc is being used having the contact piece inset from 8 P. M. to 4 A. M. If the lamp is being placed on the buoy at 2 P. M., the wing nut holding the disc is loosened and the disc turned until the division marked 2 P. M. comes directly under the point of contact of the two fingers. The wing nut is then tightened, and the lamp assembled and made ready for use. The method of attaching the lamp to the buoy staff varies under different conditions, but is immaterial so long as it is securely held in place. As the contact fingers now rest on the insulated portion of the disc periphery, it is evident that there will be no circuit between the battery and the lamps, but as the disc revolves, the contact piece will come under the contact fingers at 8 P. M., and the lamp will then light and continue thus until 4 A. M., when the contact piece will pass from under the fingers, thus extinguishing the light. This cycle of operations will continue until the timing mechanism stops, which occurs generally on the tenth day, the light burning for eight hours and being extinguished for the remainder of each twenty-four-hour period.

The introduction of the timing mechanism makes it possible to construct the lamp to give a good light during the ten-day period, and yet be entirely self-contained in a unit only seventeen inches in height with a total weight of thirty-six pounds.

The operating cost of the lamp is very favorable, being less than $3.50 for the ten-day-period of operation.

Experimental models of this lamp have been supplied to the Commercial Cable Company, the French Cable Company, and the Western Union Cable System, and have proved satisfactory in operation.

Prescribed by Radio

On the voyage of the steamer *Pocahontas,* which arrived in New York on April 4th from Italy, Dr. Michaeli Lanza, surgeon, received a message from the steamer *West Hembrie,* on her way from Amsterdam to Norfolk, Va., telling that the chief engineer was critically ill.

Dr. Lanza, by radio, asked the captain for the symptoms of the patient. On receiving the reply, he diagnosed the case as acute indigestion, and then prescribed the treatment. Later in the day the *Pocahontas* picked up this wessage from the *West Hembrie*:

"Chief engineer all right now. Will remember you in our prayers."

A Knowledge of Phillips' Code an Asset to the Telegrapher

Phillips' Code, *Latest Edition,* a thoroughly tested code of abbreviations, arranged for telegraphic purposes and contemplating the rapid transmission of press reports; also widely used as an easily acquired method of shorthand. Revised and brought up to date, with supplement to February, 1920. The new edition contains about 700 additions to the older code, and is indispensable to the operator who aspires to the standard of proficiency required by press associations, which includes a knowledge of Phillips' Code. Flexible cover, vest pocket size, $1.25 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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PERSONAL

DONALD MCNICOL, formerly editor of TELEGRAPH AND TELEPHONE AGE, on April 4th delivered a lecture to the electrical engineering classes of Sheffield Scientific School, Yale University, New Haven, Conn. The subject covered was "The Business of Electric Communication." In his talk Mr. McNicol gave a detailed review of the engineering and commercial problems on telegraphy, telephony and radio signaling.

POSTAL TELEGRAPH-CABLE COMPANY

EDWARD C. PLATT, treasurer, has been absent on account of sickness for some time past. He is now on the mend and will return to duty in a few days.

J. J. WHALEN, traffic manager, has been confined to his home for several weeks as a result of a minor operation.

F. J. KERNAN, auditor, was confined to his home for several days following an attack of grippe. He has returned to his duties, however.

W. C. DAVIET, assistant to the general manager, is back at his office, after an extended trip.

R. GOULD, of the plant department, has recently completed an inspection trip of lines in Connecticut and New Jersey.

Managers Appointed

C. O. Beatty, East Liverpool, Ohio; L. G. Allen, Westport, Oregon; Warren Hilton, Berkeley, Cal.; R. E. Young, Dunkirk, N. Y.; H. M. Gersback, Evansville, Ind.; G. E. McCord, Michigan City, Ind.; L. Pillow, Middletown, Ohio; Hugo A. Wedds, Houghton, Mich.; C. H. Ashburn, Norfolk, Va.; Miss O. Kurtz, Chicago Heights, Ill.; Mrs. L. A. Obenchain, Gastonia, N. C.; Mrs. O. Deane, Leominster, Mass.; H. S. Cowardin, Williams, Ariz.; J. E. Roberson, Portsmouth, Va.; Joseph Milam, Newport News, Va.; J. F. Henry, Dyersburg, Tenn.; Elydia C. Hollihand, Laurinburg, N. C.; M. L. King, Arcadia, Fla.; Mrs. J. M. Booth, Center Hill, Fla.; R. W. Holdren, Mayfield, Ky.; B. O. Blasier, Charlotte, Mich.; M. A. Hunt, Durant, Okla.; N. J. Montgomery, Shawnee, Okla.; Miss Paule Smith, Burlington, N. C.; G. M. Forte, Camden, S. C., and Rose M. Carr, Penn Yan, N. Y.

Buffalo, N. Y.

MISS EDNA DALHEIM, of the bookkeeping department, has returned to duty after a visit to her home.

MISS FRANCIS KELLER, manager of the Market Arcade branch, is at her post again after a two weeks' vacation.

MRS. M. L. BILL, manager of the Niagara Street branch, has returned to duty after an extended trip to Philadelphia, Atlantic City and New York.

WM. J. BRICK, of the Chamber of Commerce branch, has returned to duty after a two weeks' vacation, which, with the exception of a few days spent at his old home town, Hornell, was quietly passed at home. Mr. Brick has not been in good health for some time, and the rest has been beneficial.

N. BARTON, efficient foreman of our so-called "floating gang," is seriously ill with pneumonia at his home in Buffalo. He is, however, slowly improving. "Nat" has the best wishes of the entire force for a speedy recovery.

Boston, Mass.

Miss E. J. TUCKER has returned from her annual vacation.

JAMES F. CARTER, former night traffic chief, has been assigned to the first Chicago circuit.

D. J. LANGLOIS has returned to his old position as night traffic chief, vice J. F. Carter, who goes on days.

E. S. DEVOE, former first Chicago man, has been assigned to the second New York circuit, taking the place of Barney Curewitz, who is working the first New York circuit nights.

WILLIAM KNOWLTON has returned from an enjoyable rest spent on his farm in Woburn, Mass.

UNIT CHIEF HARRY E. MURPHY has just returned to duty after motoring through Maine.

THE telegraph school at this office is progressing rapidly.

MR. FINKLEMAN has returned to duty after an enjoyable sojourn at Revere Beach.

Commercial Cable Company

THE deferred cable service, which was suspended in January, 1916, was resumed on April 9th, 1921.

F. B. GERRARD, general superintendent, has gone East on Company's business. He will probably go as far as Canso, N. S.

GEORGE GRAY WARD'S granddaughter, Miriam Sherwell Ward, was married in the Church of the Heavenly Rest, New York, on April 12th.

S. F. AUSTIN, of the staff of the executive offices, New York, who has been in Havana, Cuba, during the winter months, returned to New York on April 5th. Mr. Austin was accompanied by his wife and son.

THE Magnetic Club of New York will hold a dinner at the Pennsylvania Hotel on the evening of May 7th. It is expected that it will be a well-attended gathering, as the club has not held a meeting for several years, owing to war conditions.

The Telegraph Industry

According to the United States Bureau of the Census, there are twenty-one telegraph companies operating in this country with a total pole line of 241,012 miles and 1,888,793 miles of wire. More than 155,000,000 messages are transmitted each year. For the convenience of customers 28,865 offices are scattered over the country. A total of 39,600 employees receive salaries amounting to nearly $40,000,000 annually.

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WESTERN UNION TELEGRAPH CO.

THE annual joint conference of commercial and traffic heads of the company from all seven divisions met in New York on April 11th. The conference lasted several days, the object being to consider matters of interest to the service. The meetings were held under the auspices of J. C. Willever, vice-president in charge of commercial department, and W. N. Fashbaugh, vice-president in charge of traffic. Other New York officials of the company took part in the meetings. Among them were: Thos. W. Carroll, general manager, Eastern Division; S. B. Haig, division traffic superintendent; J. P. Edwards, assistant to Vice-President Fashbaugh; Colonel I. D. Hough, assistant traffic superintendent, Metropolitan Division; J. F. Nathan, commercial general superintendent, Metropolitan Division, and W. J. Blenheim, general traffic manager of cables. Those from out of town consisted of: A. C. Cronkhite, general manager, Lake Division, and J. J. Welch, division traffic superintendent, Chicago; A. D. Bradley, general manager, Central Division, and A. Long, division traffic superintendent, Omaha, Nebraska; A. B. Cowan, general manager, Mountain Division, and C. H. Finley, division traffic superintendent, Denver, Colo.; M. T. Cook, general manager, Pacific Division, and C. R. Fisher, division traffic superintendent, San Francisco, Cal.; F. A. Mohr, general manager, Gulf Division, and B. P. Hancock, division traffic superintendent, Dallas, Texas; H. C. Worthen, general manager, Southern Division, and H. G. Heininger, acting division traffic superintendent, Atlanta, Ga. Upon completion of the joint conferences between the traffic and the commercial representatives separate conferences were held by the respective departments, taking up strictly departmental matters.

W. N. FASHBAUGH, vice-president in charge of traffic, who has been in Denver since about March 1st, returned to his office a week ago, much improved in health.

H. A. SMITH, division engineer of the southern division, Atlanta, Ga., was in New York for a week beginning April 1st.

CHARLES E. FRANKS, traffic supervisor of the Havana, Cuba, office, is in New York and Pittsburgh on vacation. Mr. Franks is a native of Pittsburgh.

FREDERICK W. MARTIN, of Jacksonville, Fla., has been promoted to the night chief operatorship of the Birmingham, Ala., office. Mr. Martin was formerly in the automatic department at Jacksonville, having returned to the southern division after his discharge from the United States Signal Corps service.

PRESCOTT MOREY, manager at Bath, N. Y., has been transferred to Niagara Falls, N. Y., as cashier. He is succeeded as manager at Bath by Miss Marjorie Henderson, of East Aurora, N. Y.

MRS. A. M. WHEELER, manager, Ticonderoga, N. Y., has been retired on a pension. She is succeeded by Miss Evelyn S. Woodford.

DISTRICT COMMERCIAL MANAGER F. W. BARTH, of Superintendent C. F. Ames' staff, is absent on account of illness.

FRANK V. MOFFITT, aged sixty-five years, well known in telegraph circles throughout the country, died at Cambridge Springs, Pa., on March 16th. Mr. Moffitt was successfully manager of the Western Union Telegraph Company's offices at Iowa City, Davenport and Sioux City, Iowa; Milwaukee, Wis.; Chicago, and Toledo, as well as holding many other important positions. Interment was at Iowa City, Iowa. He was a native of Newark, N. J. Mr. Moffitt suffered a stroke of apoplexy two years ago, and had moved to Cambridge Springs for the benefit of his health last October.

A. A. CUTAIR, aged fifty-seven years, in charge of the Western Union Telegraph Company's interests in the Herald Office, New York, died in Florida, on March 27th, where he had gone on a vacation. Mr. Cutair was a native of Philadelphia and was well known in telegraph circles in Greater New York.

W. H. MURRAY, former manager of the Western Union Telegraph Office at Madison, Wisconsin, died at San Diego, Cal, on March 23rd. Mr. Murray left Madison for the West in 1913. He had been manager of the Madison office for six years, and previously had worked as an operator for ten years.

Radio Corporation of America

C. J. Ross, comptroller, accompanied by Mrs. Ross, arrived home from Cuba on the steamer *Toloa*, April 11th.

GEORGE W. HAYES, of the commercial department, has returned from a business trip to Mexico City.

E. B. PILLSBURY, general superintendent, recently spent a week in Boston renewing old friendships.

W. H. BARSBY, superintendent of the Belmar, N. J., station, returned from England recently on the steamer *Adriatic*, after visiting his old home.

All America Cables

ON April 10th deferred service was resumed with Peru, Chile, Uruguay, Bolivia, Argentine and Brazil, the tariff being one-half the regular rate.

C. D. RANSOM, operator, Galveston, has been transferred to Iquique.

J. MACGREGOR, operator at Valparaiso, has been transferred to Villa Mercedes, Argentine, on account of ill health.

S. K. BABCOCK, formerly of the Commercial Cable Company, has joined the commercial department of this company at New York.

H. S. THOMAS, operator, Balboa, Canal Zone, has been transferred to Iquique.

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W. A. HOLLOWAY and F. J. Asals have been transferred from Balboa to Valparaiso, Chile.

S. B. STEVENS, manager of the Valparaiso station, leaves on five months' furlough, April 16th. He goes to England via New York.

THE deferred cable service between the United States and the following countries in Europe was reinstated April 9th: Austria, Great Britain, Italy, Belgium, Greece, Hungary, Denmark, Sweden, Luxenburg, France, Ireland, Norway, Germany, Holland, Portugal, Gibraltar, Iceland, Spain, and Switzerland.

CANADIAN

AT a meeting of the Board of Directors of the Great North Western Telegraph Company, held at Toronto, April 7th, D. B. Hanna was elected president and Geo. D. Perry, vice-president and general manager of the company.

THE city of Montreal, Quebec, will expend $200,000 constructing underground conduit system, and all overhead wires will be placed therein, the various wire companies paying rental to the city for the space occupied in the conduit.

W. MURDOCK, a dominion government telegraph operator, located at the sixth cabin, north of Hazelton, B. C., died on March 11th.

PUBLISHER'S SON "CUBBED" IT

Elliot Blumenfeld's Father Owns the London "Daily Express"—Wants Him to Get International Angle

When the White Star liner *Adriatic* sailed for Europe on April 5th, on board was a youth of twenty-two years, who six months ago came to this country looking for a job as "cub" newspaper reporter. He was an Englishman, was commissioned a lieutenant when eighteen, and fought with the British army four years.

After the war he worked on London newspapers, and last fall came here, where he obtained work on one of the big morning dailies. Nobody knew him at the time or paid much attention to him. He was a rabid Lloyd George supporter. His first assignment was to "cover" a Sinn Fein meeting. He came back to the office with his hat crushed in and his hair mussed.

At the meeting, it was learned later, he was in the midst of the ceremony when one of the speakers said something which did not suit him. After that he chased ambulances, reported fires, answered riot calls for the police reserves and "covered" all the work expected of a "cub."

The young man was Elliot Blumenfeld ,son of Ralph D. Blumenfeld, publisher of the London *Daily Express* and one of the wealthiest men in England.

After the war, young Blumenfeld told his father he would like to enter the newspaper game. His father advised him to get some experience first on papers in other countries. He worked on papers at home, learning the London town method of gathering news. Then he decided to visit this country.

"I got it, all right, boys, I'll tell the world. Yes, and you can see I even became inoculated with your slang," said young Blumenfeld.

DRAMATIZE EVEN A CAT

"You fellows are the best reporters in the world. I believe the American newspaper men are faster and can gather more news in a day than we can in a week, but the trouble is you become so sensational! If a cat is seen crossing the street your papers make an 'extra' out of it. In our country nothing short of a revolution seems to get us excited in the papers.

"But you fellows sell more papers, and, believe me, when dad gives me his 'sheet' you'll see a little of that American sensational stuff in it. But I've got to show him I'm a reporter first. He worked his way up the ladder from reporting fires back home and then flashing news across the ocean to this country until he bought the paper.

"But I hope the cops in France, where I'm making my next headquarters, provided the newspapers there give me a job, will be a little more energetic in giving information than they are here. One of the first nights I began working here I got out on some murder story. I made the rounds of the police stations in search of some information, and didn't find one cop who knew anything or would say a word. They were as tight as a clam. If you are a newspaper fellow they won't give you the correct time. It took me five minutes more to get the stuff I wanted from another source."

A few months after entering the office young Blumenfeld became one of the best. When he decided to leave for Paris he declined a raise. He wanted to learn the French end, too, he said, in Paris.—*New York Evening Mail.*

[The father of Elliot is Ralph D. Blumenfeld, proprietor of the London *Express,* well known in telegraph circles in the United States previous to twenty-five years ago. Mr. Blumenfeld is a native of Wisconsin, and probably his first newspaper work was in Chicago in 1883 and 1884, where he acted as agent and correspondent for TELEGRAPH AND TELEPHONE AGE. He was one of the best telegraph operators in the service and soon found his way to New York, where he later entered the newspaper field, and his climb to wealth and to the leading position in the foreign newspaper world reads like a fairy tale. Mr. Blumenfeld occasionally visits the United States, and his old friends are always glad to welcome him.—ED.]

E. A. NEWMAN, manager of the Postal Telegraph Cable Company, Des Moines, Iowa, writes: "I very much enjoy reading the AGE."

J. H. BAUGHMAN, wire chief, Bellefontaine, Ohio, writes: "I have been a subscriber to TELEGRAPH AND TELEPHONE AGE ever since I have acted as wire chief, and never felt that I wanted my money back."

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No. 9 NEW YORK, MAY 1, 1921 Thirty-ninth Year

CONTENTS

Carrier Current Telephony and Telegraphy. By E. H. Colpitts and O. B. Blackwell (Continued in part from page 179, April 16 issue). 194

Last Roof Fixture Gone 195

Recent Attainments in Wired Radio. By R. D. Duncan, Jr. (Concluded from page 174, April 16 issue) 196

Civil War Military Telegraphers in Bronze 197

Mechanics and Circuit of the Connector. By Harry E. Hershey, Automatic Electric Company, Chicago 198

Railway Time Service. By H. Hulatt (Continued from page 177, April 16 issue) 201

Make the Workers' Lunchrooms Attractive. By Frank H. Williams.. 202

St. Pierre Western Union Cable Station. Do You Believe It? Be a Gloom Chaser. What It Costs to Telegraph in Germany..... 203

Student's Course in Technical Telegraphy. By Louis Casper. Lesson 26 204

Editorial—Amplifying the President's Voice. Old Time Telegraphs. Motor Pole Raising 206

The Railroad—Demonstration of Carrier Current Telegraphy and Telephony. Marconi Company to Operate Posts and Telegraphs.. 209

Reliable Protection Products Produced in New Factory..... 210

Wireless Fog Signals to Be Installed at Entrance to New York Harbor. Censorship Off News Sent Over Naval Wireless..... 211

Broad Street, New York, as a Cable and Radio Center. Canadian National Telegraphs 212

A Problem in Electrical Engineering. Cable Staff Banquet, St. Pierre, Miquelon. Western Union Charges Plot 213

Personal. Postal Telegraph-Cable Company. The Magnetic Club..... 214

Western Union Telegraph Company 215

Radio Corporation of America. All America Cables..... 216

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Carrier Current Telephony and Telegraphy

By E. H. Colpitts and O. B. Blackwell

(*Continued in part from page 179, April 16 issue*)

Selection—Electrical Filters. When a number of one-way channels, each employing a different carrier frequency, are operated by superposition on a common line, each channel much be connected with the line through selective circuits which transmit only the range of frequency assigned to that particular channel. Not only must the demodulator assigned to a given channel be prevented from receiving from the line the currents of other channels, but the sending modulator must be prevented from putting onto the line currents of frequencies outside of its assigned bands, for, as was pointed out in the discussion of modulation, frequencies other than those desired are developed in the output circuit of the modulator, and if these currents were permitted to reach the line those whose frequencies fell within the transmission band of some other channel would be transmitted to the demodulator of that channel through its receiving selective circuit.

As will be brought out later in the discussion of the behavior of lines with respect to their transmission efficiency at carrier frequencies and with respect to crosstalk between adjacent circuits on a pole line, the most desirable frequency range is rather limited. For this reason, where it is proposed to secure a maximum number of channels simultaneously operating on a given circuit it is necessary to make the frequency interval between the adjacent carrier channels as small as possible. The first limitation to the frequency separation between carrier frequencies is determined by the fact that, as has already been pointed out, the width of the side band must correspond to the voice frequency range; that is, even with ideal apparatus the carrier frequencies must have at least a separation of approximately 2000 cycles per second. The ideal selective circuit which would permit this close spacing of frequencies is one which would transmit efficiently this side band, having a frequency range of 2000 cycles, and would absolutely block off frequencies outside of this band. Because it is not physically possible to secure such ideal circuits, we are obliged to make a greater separation in carrier frequencies than that made necessary by the width of the side band.

The nearest approach to this ideal selective circuit, particularly for carrier operation at moderate frequencies, is secured by the use of what has come to be known as an "electrical filter." This arrangement was invented and thoroughly studied by Dr. G. A. Campbell even before practical carrier operation was made possible by the perfecting of vacuum tubes and the development of their use as oscillators, modulators and demodulators. Campbell's electrical filter is a network composed of inductances and capacities which transmits with a minimum of attenuation currents whose frequencies lie in a predetermined range and attenuates very greatly currents whose frequencies lie outside that range. While these filters may take a variety of forms to meet special needs, they are all alike in that the currents traverse a succession of meshes or "sections," the attenuating effects of which are cumulative. The discrimination against the frequencies which it is desired to exclude may be increased to any physically practical value by increasing the number of sections. As this filter transmits a band of frequencies, it has, for convenience, been termed a "band-pass" filter.

At this point it may be instructive to compare the performance of the filter with that of a pair of loosely coupled circuits resonant to a frequency in the transmission band of the filter. It is obvious from the attenuations of this circuit in the frequency range of the side band that such a circuit is very poorly adapted to the purposes of carrier telephony.

Referring again to the band pass filter, it is of interest to consider the relation between its attenuation characteristic and the operation of the system. The form of the attenuation curve within its transmission range is important from the standpoint of the quality of the transmission of the carrier channel in which the filter is used. If the attenuation is uniform throughout the frequency range which the filter is designed to pass, the effect is merely the same as that of increasing the length of line by a corresponding amount, and the loss can be compensated for by amplification inserted somewhere in the system. If the attenuation is not the same for all frequencies within the band, as, for example, if it is greater at the edges than at the center of the band, then the difference in transmission equivalent for different components of the side band will introduce a similar distortion into the over-all transmission frequency curve for various voice frequencies, as measured from the modulator input to the demodulator output. Such a distortion would manifest itself by more or less impairment in the quality of the telephone transmission.

Both the magnitude of the attenuation within the frequency band transmitted and the variation with frequency are dependent upon the dissipation of energy in the coils and condensers, as well as upon the choice of their electrical constants, so that the problem of securing filters of desired transmission characteristics has been largely one of obtaining reactance elements of high time-constants and of high accuracy and stability. For the capacities mica condensers are largely used. For the inductances a special core material of finely divided iron has been developed which has made possible toroidal iron core coils which are superior in time-constant to air core coils for frequencies up to the highest value used by us. At the same time they are more compact and have less stray field. Transformers having similar iron cores are also used throughout the carrier system. A description of this type of core material and a statement of the results obtained by its use in the telephone plant will form

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the subject of an engineering paper to be published at an early date.

As has been indicated above, the attenuation of the filter outside of its efficient transmission band, determines the necessary frequency separation between the side bands of adjacent channels and, therefore, to a large degree also the number of channels which may be operated in a given frequency range. For example, if channel *A* is operating through the filter, then the frequency band of channel *B* must be so chosen in the frequency range that the attenuation of the filter channel *A* for currents of the frequencies of channel *B* is at least as great as some value fixed by the cross talk requirements imposed on the system.

The attenuation outside of the transmission band is practically independent of the resistance of the coils and the dissipation in the condensers, but is determined almost wholly by the arrangement and values of the reactances employed in a section and by the number of sections. Numerous special arrangements have been devised for controlling the form of the attenuation curve and for giving to the filter an impedance best suited to the circuit with which it is connected. It has been found practicable to design filters which permit of operating with an interval of about 1000 cycles between adjacent telephone channels; that is, 3000 cycles between adjacent carrier frequencies.

In addition to separating the various carrier channels from each other, it is found convenient from an operating standpoint to separate within the toll offices the carrier frequencies as a group from the frequencies used for ordinary telephony and telegraphy. For this purpose the portion of the line which is used in common is connected with the carrier apparatus through a "high-pass" filter, which transmits all frequencies above a predetermined value (in this case above about 3000 cycles), and suppresses all frequencies below this value (in this case below 3000 cycles). Similarly connection is made with the ordinary telephone and telegraph circuits through a "low-pass" filter, which in this instance passes frequencies below 3000 cycles and suppresses those above. Accordingly, the high-pass filter is designed to offer a high input impedance to currents of ordinary telephone frequency, and to have an impedance equal to that of the line for currents within the carrier frequency range. Correspondingly, the low-pass filter is designed to offer a high input impedance to currents of the carrier frequency range and to have an impedance equal to that of the line for currents of ordinary voice frequencies. The attenuation of the high-pass filter is small for carrier frequencies and large for voice frequencies, while the reverse is true for the low-pass filter.

A low-pass filter is also used in the output circuit of the demodulator to prevent currents of frequencies higher than the essential voice range from being transmitted to the subscriber.

(*To be continued*)

Last Roof Fixture Gone

The last telephone roof fixture in New York City has just passed into oblivion, writes H. Folger, in *Telephone Review*. It is not a great stretch of the imagination to say that in the halcyon days of roof fixtures the sunshine rarely penetrated to the sidewalks and streets in downtown New York. With strand after strand of wire strung along poles or stretched from roof to roof there resulted a giant web which produced a semi-twilight, even in the middle of the day. Yet the citizens of New York in 1890 accepted this condition as a natural phenomenon of their daily existence, believing that unfiltered sunlight was reserved for the country or the more open spaces uptown.

Old timers still tell of how a "way leaves agent" used to get owners' consent to use their roofs for wires and of the methods to which he had to resort to break the news gently. After telling about how the company would agree to keep the roofs in repair, in some cases paying a yearly rental, the agent would display a pocket edition model of the standard roof fixture of the type to be put on his roof, which might be slightly larger. Picture the owners' surprise when, a few days later, a two-horse truck appeared in front of his house carrying a big load of lumber for the "slightly larger" roof fixture

But even this arrangement had its advantage for the property owner, for in time it became almost fashionable to have fixtures on one's roof, for the yearly rental plus the agreement that the telephone company would keep the roof in repair was not to be ignored As time passed by the roofs of Manhattan were dotted with wooden fixtures which carried from forty to one hundred wires. Between 1890 and 1906 there were fixtures on more than one thousand roofs in Manhattan, and we were obliged to maintain a special force of roofers to keep the rented roofs in repair.

With the gradual extension of the interior block system pole lines and roof fixtures disappeared. Most of them were removed several years ago, but on account of peculiar conditions existing in some places a few roof fixtures were maintained until now.

HORACE L. HOTCHKISS began his career as a banker in 1857 with the American Exchange Bank, New York. Some years later he organized the firm of Hotchkiss & Burnham, and it was this banking firm which established the first private wire, which went from the office on Wall Street across house tops to the Fifth Avenue Hotel. Many regarded the venture as one involving a too great risk and expense. But instead of that, it so rapidly justified its establishment that in a little while other brokerage houses began to secure private wires, until now they extend from New York to all parts of the country

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Recent Attainments in Wired Radio

By R. D. Duncan, Jr.,

Radio Engineer Signal Corps, U. S. Army, *Journal of the Franklin Institute.*

(*Concluded from page 174, April 16 issue*)

In these figures the heavy line curves represent the current variation obtained for the real line load, and the small circle points represent the current variation obtained for the artificial load of the proper constants; the cross, square, triangle and large circle points represent the current variation obtained with artificial loads of characteristics differing from the specified ones by the amounts indicated. The agreement between real line values and those obtained on the proper artificial load is observed to be unusually exact. Any great departure from the conditions simulating the real line load causes a shift in the resonance point as well as an alteration in the shape of the resonance curve.

Throughout this investigation special interest, of course, has been attached to the behavior of the line load at the high range of radio frequencies, viz., 1,000,000 to 200,000 cycles per second (300 to 1500 metres), since it is within this range that the transmission and reception tests were conducted. While from the data obtained, it is always possible to construct artificial loads which will simulate the real line load in its characteristics for individual frequencies, it is both desirable and convenient, from an experimental standpoint, to build up an artificial load which will simulate at least the reactive component of the real load over a given range of frequencies. The variation in resistance with the frequency may be taken care of by a properly constructed variable resistance. From the reactance curves of Figs. 17 and 19, it is evident that for wave-lengths below 1600 metres (frequencies higher than 187,500 cycles per second), the real line load loses its distributed characteristics, and behaves as would a circuit of lumped constants. The reactance curves of the line load which obtain for the short wave-lengths are similar in shape to that of a lumped inductance, operating near its fundamental wave-length where the effect of the distributed coil capacity is appreciable. This leads to the belief that by properly choosing a value of inductance, which it is assumed to be free from capacity, and a parallel connected capacity, it should be possible to build up a circuit which would closely simulate the real line load in its reactive properties. For purposes of experimentation, over frequencies from 900,000 to 200,000 cycles per second (wave-lengths 333 to 1500 metres), an artificial load has been constructed which represents the real line load of this range of frequencies.

By a method outlined by Kolster, it was computed that a *true* inductance of 0.0789 milli-henrys in parallel with a capacity of 350 micro-microfarads, would give the desired reactance variation. With-

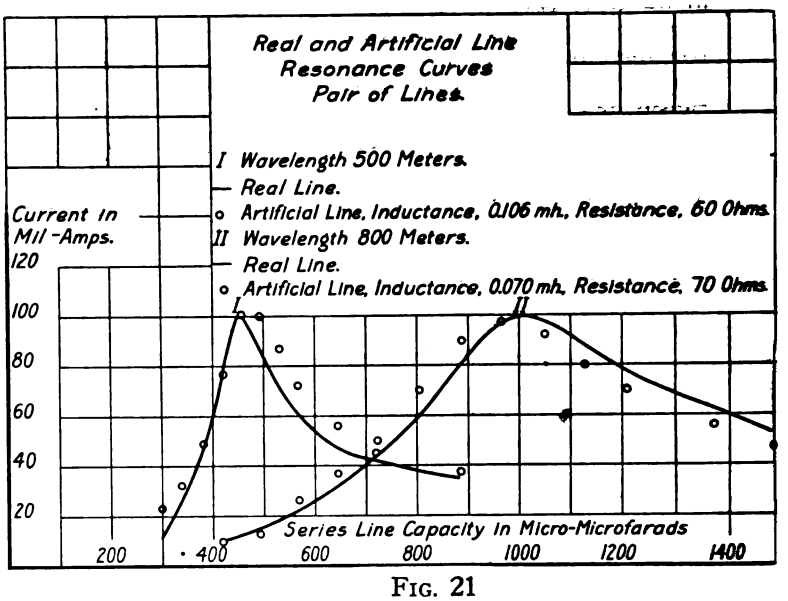

FIG. 21

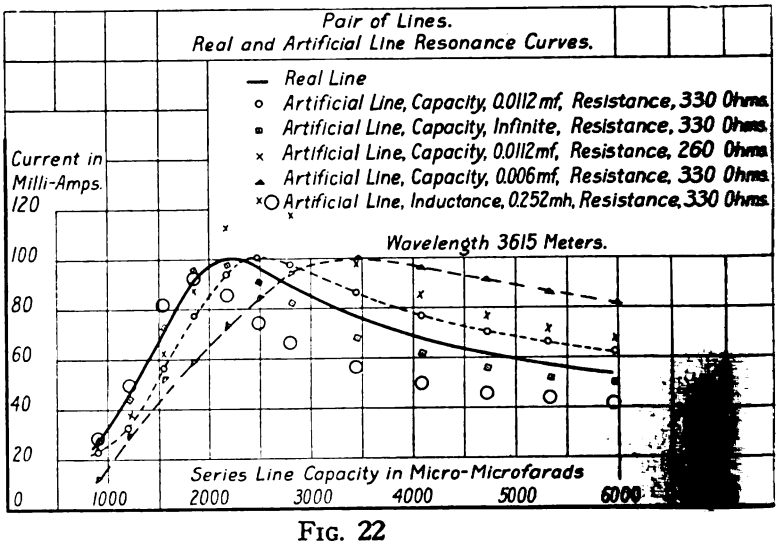

FIG. 22

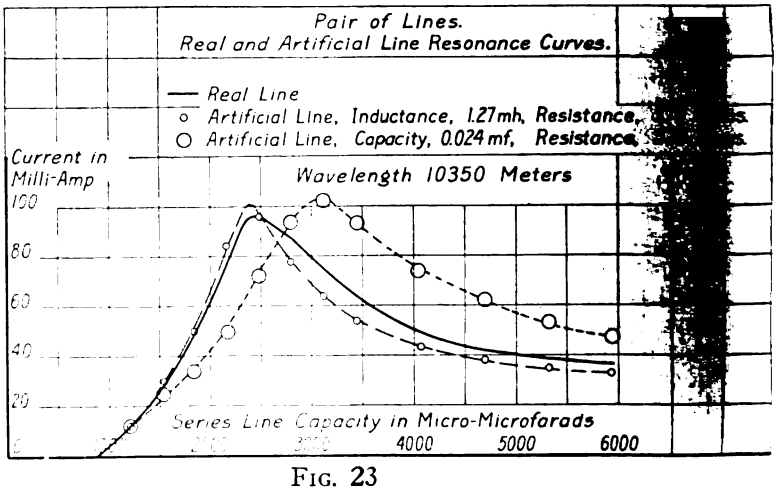

FIG. 23

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ut resorting to extreme precision in construction, n inductance was built whose value was computed o be 0.07660 milli-henrys, and whose actual value, neasured both at 1000 cycles and over the operat-ng range of high frequencies extending up to ,000,000 cycles per second, was 0.0750 milli-enrys. This inductance in parallel with a capacity f 400 micro-microfarads gives the measured reac-ance variation as shown by the large circle points n Fig. 24; the full line curve of this figure repre-ents the reactance of variation obtained for the air of lines plotted as functions of w. The agree-ent between the reactance values of the real and rtificial loads is seen to be quite exact. A view of n artificial load is shown in Fig. 25.

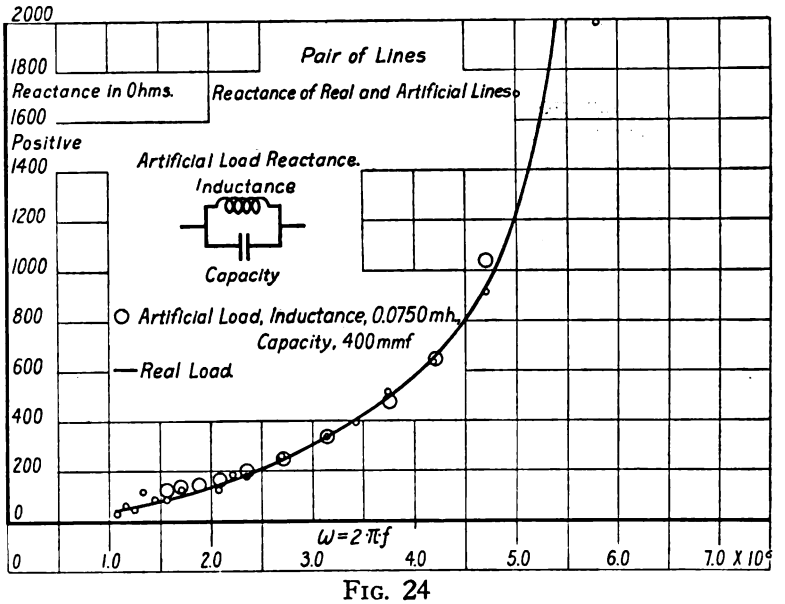


FIG. 24

Civil War Military Telegraphers in Bronze

In the Soldiers' and Sailors' Memorial Hall at 'ittsburgh, Pa., is the bronze tablet commemorating he United States Military Telegraph Corps from llegheny County, Pa. There are forty-three ames and twenty-eight faces shown on the tablet.)f this number only nine are living. They are)avid Homer Bates, E. W. McKenna, Albert B. handler, James H. Nichols, George W. Perkins, ohn A. Torrence, F. A. Stumm, George A. Low nd Robert F. Weitbrec. The accompanying en-raving is made from a photograph of the bronze ablet. The likeness of each telegrapher shown is egarded as perfect as bronze can be made.

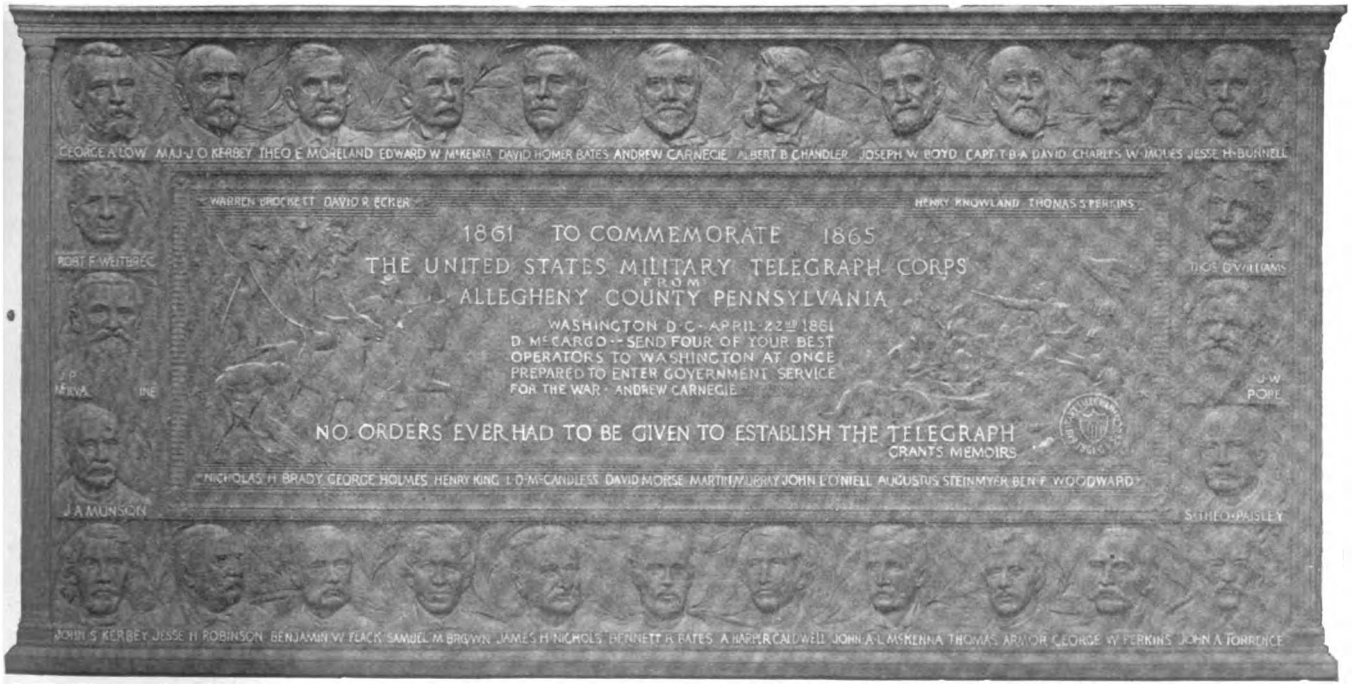
New Radio Call Book

The Consolidated Radio Call Book, second edition, is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.



BRONZE TABLET
SOLDIERS' AND SAILORS' MEMORIAL HALL, PITTSBURG, PA.

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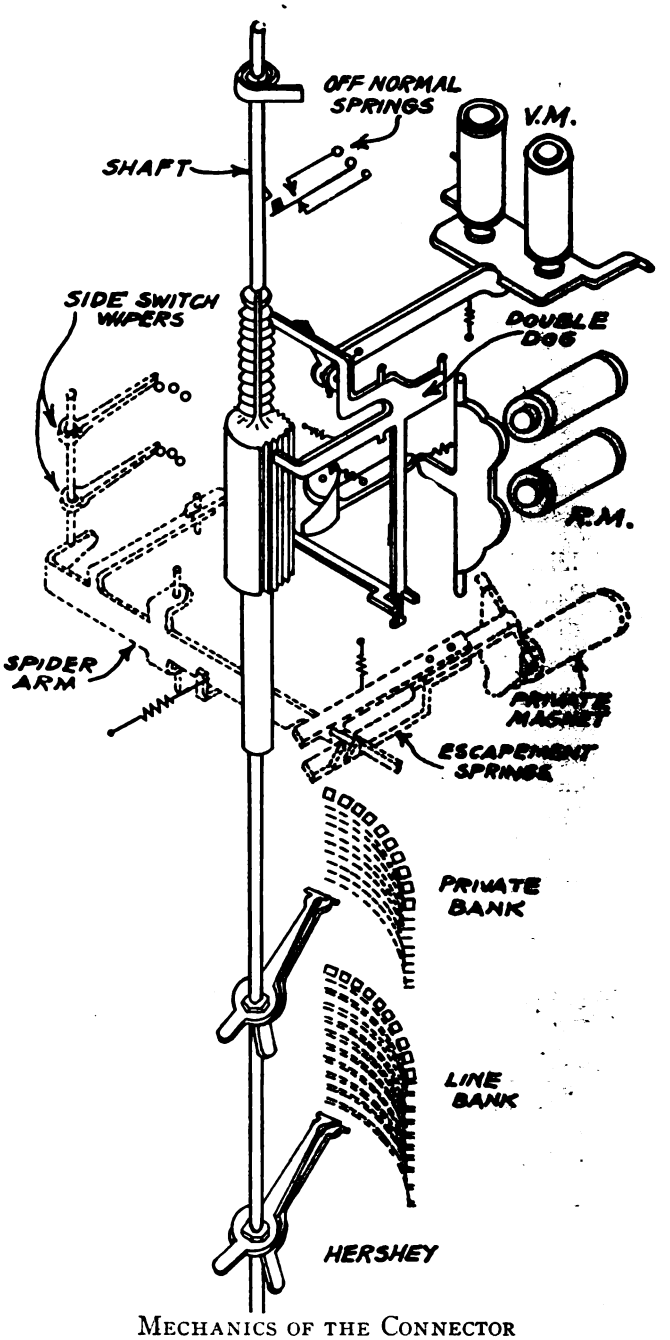
Mechanics and Circuit of the Connector

By Harry E. Hershey of the Automatic Electric Company, Chicago

The connector switch consists primarily of a shaft which is capable of a step by step vertical movement, following which it is capable of a step by step rotary movement. The lower extremity of the shaft carries two wipers, the lower or line wiper is a double wiper and is intended to make contact with the bank shown on page 148, April 1st issue. The upper or private wiper is a single wiper and is intended to make contact with a bank similar to the one shown in Fig. 1, except that it is made up of 100 single contacts and is always placed directly above the line bank. Midway of the shaft may be seen the vertical teeth by means of which the shaft may be raised step by step; just below is the hub which bears the rotary teeth, by means of which the shaft may be rotated step by step. At the top of the shaft may be seen a coiled spring.

It is this spring which causes the shaft to return to normal from a rotated position. Upon releasing, the force of gravity is utilized to lower the shaft from a raised position. Just below the coiled spring may be seen a set of "off normal" springs. With the shaft at normal a projection rests upon the movable spring and holds it in contact with the lower spring. When the shaft is raised, one or more steps, the movable spring breaks contact with the lower spring and engages the upper spring. At VM is shown a pair of vertical magnets, which, by means of their armature and the pawl at its end, raise the shaft one step each time they are energized. The double dog is merely a ratchet intended to hold the shaft in an operated position. At RM is shown a pair of rotary magnets, which, by means of their armature and the pawl at its end, rotate the shaft one step each time they are energized. The double dog also acts as a ratchet for the rotary movement, hence the name, "Double Dog."

In Fig. 6 is also shown a private magnet, escapement springs, a side switch wiper, and a spider arm. These mechanical features may be disregarded at this time, as they will be discussed in a later chapter.



Mechanics of the Connector
Fig. 6

Circuit of Vertical and Rotary Magnets

We are now ready to study the circuit by means of which the vertical and rotary motion is produced. Relay L (Fig. 7) is the line relay; the re-

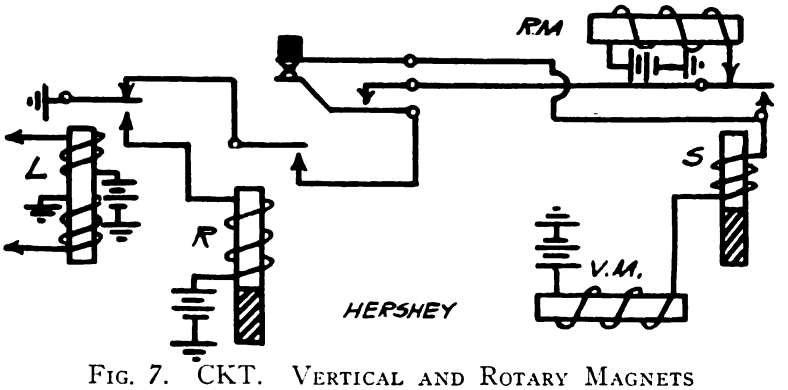


Fig. 7. CKT. Vertical and Rotary Magnets

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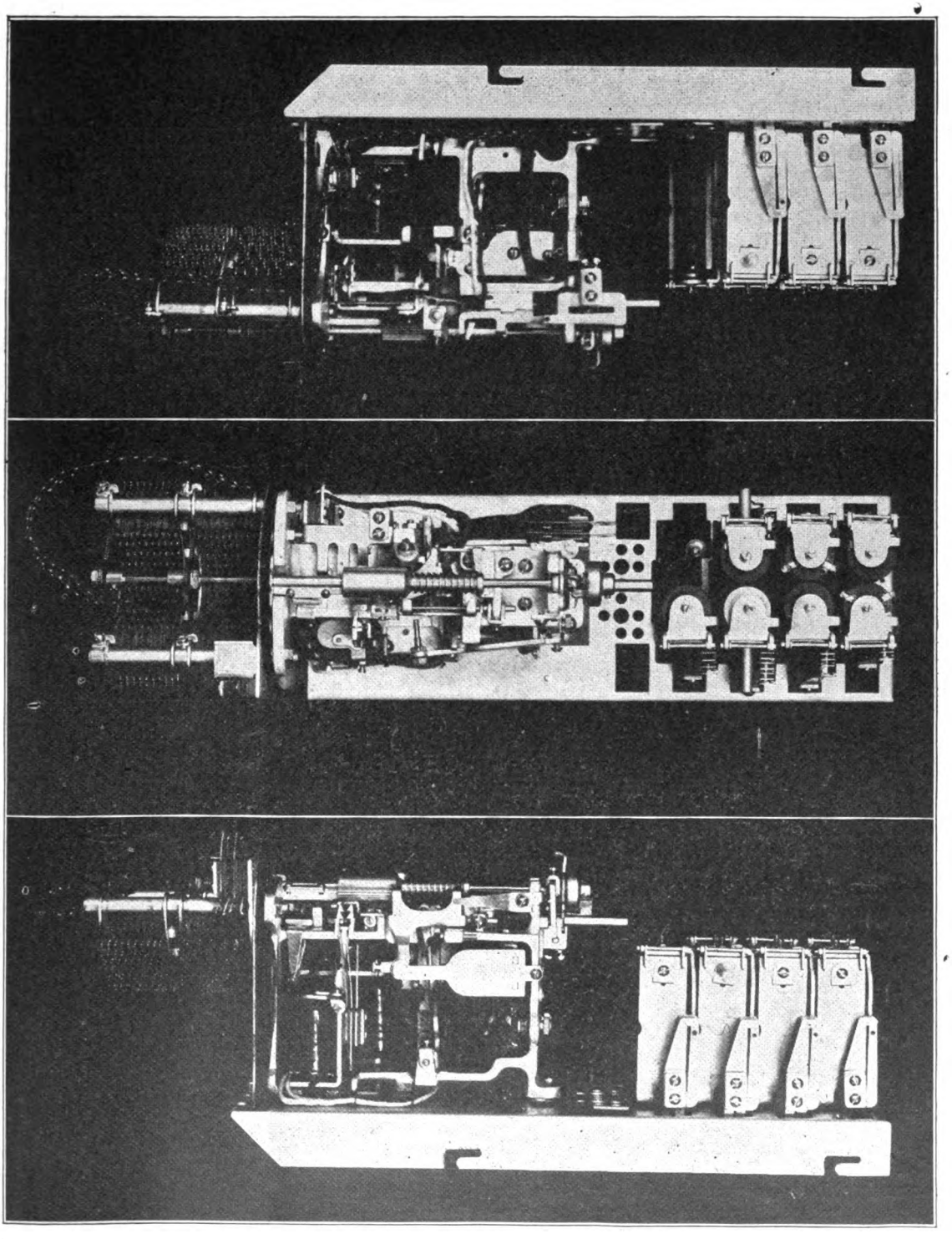
sistance of each winding is usually 200 or 250 ohms. Relay R is the release relay, the resistance of which is now 800 ohms. A few years ago it was common practice to make this relay 1,300 ohms. Relay S is termed the series relay, and is low in resistance so that the vertical magnet may operate through it. The resistance of this relay may be from one-half to four ohms. The rotary and vertical magnets usually have 26 ohms in each coil.



CONNECTOR SWITCH OF AUTOMATIC ELECTRIC COMPANY'S MANUFACTURE

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When the switch hook at the substation is operated the circuits of relay L and R are closed, as has been previously explained. We will now assume that the subscriber dials the figure 6. As the dial returns to normal, the circuit of line relay L is momentarily opened 6 times. Each time the armature of relay L falls back it opens the circuit of relay R. Relay R does not de-energize, however, on account of its being a slow acting relay. The first time the armature of relay L falls back a circuit may be traced from ground, break springs relay L, make springs relay R, break contact "off normal springs," relay S, through vertical magnet to negative battery. The current flowing in this circuit will cause relay S and the vertical magnet to operate. Relay S, being a slow acting relay, will maintain its armature in an operated position for the fraction of a second. The next time the armature of relay L falls back the same circuit is closed, except that since the shaft has already been raised one step the circuit will pass through the make contacts of the "off normal springs," and the make contacts of relay S. Shortly after the last impulse of current has passed through the relay S, it will de-energize and cannot again become energized on account of the open circuit at the off normal springs.

All is now in readiness for the subscriber to call a second figure. Let us assume that the subscriber dials the figure 5, thus opening the line circuit five times and causing the line relay to momentarily release its armature a like number of times. Each time the line relay L de-energizes a circuit may be traced from ground, break springs relay L, make springs relay R, make off normal springs, break springs relay S, through the rotary magnet to negative battery. The current flowing in this circuit will cause the rotary magnet to energize five times and thereby rotate the shaft and wipers into engagement with the bank contacts associated with telephone number 65.

QUESTIONS

A. Why are the rotary and vertical magnets made in pairs instead of utilizing single magnets?

B. In your opinion which movement would be the most difficult to produce, the vertical or rotary?

C. What would be the result if the coiled spring at the top of the shaft were too stiff?

D. What would be the result if the subscriber's line had a dead ground on the negative side? On the positive side?

E. What effect would be produced if the slug on relay R were cracked? If the slug on relay S were cracked?

F. If one winding of relay L were reversed would the relay operate?

G. If the winding of relay S were reversed would it still retain its slow acting feature?

H. What would be the result should the subscriber again operate his dial? Would this be objectionable?

I. Assuming that the springs of relay S fail to make, where would the wipers be standing after dialing the figure 7?

American District Telegraph Company of New Jersey Annual Report

The American District Telegraph Company of New Jersey, and controlled companies, report for the year ended December 31, last, the largest gross revenues in the history of the company, amounting to $4,645,515, against $3,894,090 in the previous year and a surplus after interest charges, etc., $545,043, against $418,537 in 1919.

The comparative income account follows:

	1920	1919
Gross oper. revenues	$4,645,515	$3,894,090
Oper. exp., depreciation, etc.	4,213,312	3,380,389
Balance	$432,203	$513,701
Special adjustments, net	137,525	.....
Total	$569,728	$513,701
Provision for obsolete equipment and other special adjustments debit	.....	69,384
Balance	$569,728	$444,317
Interest on bonds	24,685	25,780
Surplus	$545,043	$418,537

The consolidated balance sheet as of December 31st, last, shows cash in banks and on hand of $328,275; materials and supplies $386,724; bills and accounts receivable, $348,475; accounts payable, $202,863; surplus, $2,377,064, and total assets and liabilities, $16,163,567.

The company's first mortgage 5 per cent. bonds outstanding have been reduced from $604,000 at December 31, 1919, to $445,000 at the close of December 31, 1920. Bonds aggregating $11,000 were cancelled during the year through the sinking fund.

The Baudot Printing Telegraph System

The issue of a second edition of the "Baudot Printing Telegraph System," by H. W. Pendry, is fully justified by the extension of the use of that system in the United States and in Europe, the improvements made in the apparatus, and the general adoption of the first edition as a class manual.

The descriptions and diagrams of somewhat intricate instruments and connections are so clear that it is possible to obtain a good knowledge of the system from the book alone, without the necessity of seeing and using the instruments before the information in the book can be said to have been usefully assimilated.

Of the new matter introduced, the most notable is that treating of the Murray phonic motor and the Gulstad Relay. The chapters on Duplex Baudot and Baudot repeaters has been enlarged. The number of illustrations and diagrams has been increased from 72 to 94. The price of the book is $2.50 per copy, and orders should be addressed to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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Railway Time Service

By H. HULATT, Manager of Telegraphs, Grand Trunk Railway, Montreal.

(*Concluded from page 177, April 16 issue*)

Briefly, under the "centralized" plan, all records and compilation of same is centralized in the head office of the time service department:

1. Officials having jurisdiction over men coming under watch inspection regulations, at the beginning of each year forward to the head of the time service department a list of all such men actually in service at that time; this list is kept corrected by the sending in of proper forms each comparison period. At the foot of this form has to be shown the total number of men in service coming under watch inspection regulations after corrections called for by the form have been made. A "watch record card" is made out in the time service department covering each employee so shown, and during the year a complete record of the man is kept on such card.

2. Watch inspectors have no specific men assigned to them. Employees are allowed to go to any watch inspector they find most convenient, or choose, thereby placing all inspectors on a competitive basis, and ensuring good workmanship, and fair treatment to the men.

3. Men sign comparison sheets, the inspector allowing a man to do so provided in the event of his being a new man presenting an order of examination and his watch being approved, or in the event of the man already having had his watch approved, presenting a rating card, or a repair card should he be carrying a loan watch.

4. Inspectors turn completed order of examination in to the time service department, where record is immediately made on card of man's watch, a portion of the completed order is also turned in to the man's superior officer by the employee.

5. At the end of each comparison period the inspectors turn their comparison sheets, together with particulars as to what watches have been cleaned since the previous comparison period, into the time service department, where, after the latter's records have been corrected by the forms received from the various officers, the comparison sheets are carefully checked, and delinquent reports forwarded to the officers concerned.

These reports indicate name and occupation of man delinquent, his certificate number, number of times he has been delinquent since beginning of year, and the number of consecutive times reported. It also indicates separately the same particularly in connection with men who have failed to present their watches for approval and are consequently not eligible for service. At the foot of such form, provision is made to indicate the total number of men coming under watch inspection regulations during the period covered by the report, total number delinquent, and percentage delinquent.

These reports are then summarized and forwarded to the general superintendents and superintendents of motive power, and copies to the vice-president.

Graphs are also prepared, which show fluctuations in the number of men coming under watch inspection regulations each period, fluctuations in percentage delinquent, and also percentage of efficiency.

6. Variation in the performance of watches is carefully scrutinized, and where requisite matter promptly taken up, not only with the man who owns the watch, but the watch inspector and the official having jurisdiction.

7. Periodically, advices are sent out by circular indicating men whose watches are due for cleaning. On receipt of such advices officers having jurisdiction notify their men on a special form. Inspectors are also furnished a copy of the circular in order that they may, after a reasonable time has elapsed, notify the man that unless he complies with requirements he, the inspector, will be compelled to refuse him comparison, on instructions from the head office.

8. The time service department also forwards to each man who has allowed his watch to run down a reminder, drawing attention to the danger involved by such carelessness.

9. The repairs to company clocks, regulators, and the ordering of new clocks is handled entirely through the time service department, enabling a proper check and comparison of prices covering cost of repairing and cleaning clocks.

This system enables the head of the time service department to maintain at all times a very close supervision of the work of his department, relieves the inspectors of a great deal of clerical work for which they are usually not well equipped, and permits the heads of the operating and mechanical departments to have full knowledge as to how the rules and regulations are being observed.

SECURING THE CO-OPERATION OF OFFICERS AND EMPLOYEES

It has to be admitted that the value and necessity of time service regulations is not always appreciated by the employees, who very frequently look upon the inspectors as a nuisance at their being compelled to have their watches approved and subsequently compared with standard time periodically. In order to get efficient results, it is absolutely necessary to secure the hearty co-operation of all concerned. This can be gained, first by reducing to a minimum the amount of clerical work on the part of the local watch inspectors and also in the offices of the officers having direct jurisdiction over the men.

2. By educating the men as to the necessity for watch inspection regulations by the head of the time service department or representative attending Safety First Meetings, and explaining thoroughly the reasons for such regulations.

3. Making the men realize that the time service department is not interested in any way in the sale of watches or in any revenue accruing to the watch inspectors account cleaning and repairing of watches, and that the department will help the men

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without bias in any cases of disagreement between watch inspectors and themselves.

4. By holding conventions of watch inspectors where the problems of the department can be fully talked over, and thereby creating an esprit de corps, letting the inspectors know that they will be backed up in their decisions provided their judgment is right.

5. Keeping all officers concerned posted as to how the regulations are being taken care of on their divisions, both in so far as individuals are concerned, and also as to how the performance of their division compares with others.

This article indicates the system and principles under which the time service department of the Grand Trunk has been run since it was reorganized early in 1916, and the following figures showing what has been accomplished may be of interest.

TIME SERVICE STATISTICS

YEARS ENDING APRIL 30TH

	1917	1918	1919	1920
Number of watches approved during year...	8,914	10,684	7,675	8,988
Total number of comparison periods	26	24	24	24
Average number of men in service coming under watch inspection regulations each comparison period during year	6,598	6,152	5,365	5,662
Total average percentage men delinquent each comparison period during year	15.4%	8.9%	5%	4.8%
Total number of individual comparisons made by employees at watch inspectors during year.	145,132	132,406	121,929	129,697
Total number of men reported to time service department as coming under watch inspection regulations, who at end of year had been so shown more than 30 days, without submitting watch to an inspector for approval..	98	27	48	23
Total number of watches rejected during year all replaced by standard movements	96	87	9	15
Total number of pendant set watches changed to lever set during year..	267	26	4	1
Total number of pendant set watches in service at end of year to be changed to lever set when next due for cleaning	35	15	4	7
Total number of watches repaired and cleaned during the year.....	2,827	3,631	4,122	3,221
Total number of watches sold by inspectors on deduction orders during year	847	554	314	366
Total number of clocks cleaned and repaired during year	300	210	213	214

Make the Workers' Lunchrooms Attractive

By FRANK H. WILLIAMS

Good food, properly served and eaten under pleasing conditions will go far toward curing an ingrowing grouch and will go far toward making a worker feel more enthusiastic over his job and more like being courteous and kindly to those people with whom the worker comes in contact. Consequently the workers' lunchroom has a much more important position in securing the best possible results from workers than some managers seem to realize.

Because of the importance of the lunch in the plant it is never wise to simply install a place to eat and let it go at that. The eating place should be made as attractive as possible, and the more successful the plant is in making the lunchroom attractive, the better pleased the workers will be and the more their production will increase.

In this connection, it is interesting to note what has been done along this line by the Home Telephone and Telegraph Company, of Fort Wayne, Indiana.

This concern recently installed lunchrooms at both its main exchange and at the southside branch. In both of these exchanges a special effort was made to make them particularly attractive and the company and the employees feel that the efforts along this line have been signally crowned with success.

The cafeteria or lunchroom at the main office includes among its furnishings fern decorations and fresh cut flowers in abundance, beautiful electric lamps, as well as attractive looking paper on the wall. It is no wonder that the young ladies who are employed as operators by this concern are always glad to eat in this lunchroom.

The cafeteria or lunchroom at the south exchange of the company is lighted from either end of the room. On dark days beautiful lamps furnish the light. Flowers decorate the tables. The company sees to it that there are always fresh flowers on the tables in this south branch lunchroom, because it is realized that there is nothing like flowers to give the right sort of atmosphere to an eating place of this kind.

Of course, after eating a good luncheon within attractive environment, young ladies always like to get together and chat for a while, so the company has arranged comfortable and attractive rest rooms in both the main exchange and the south branch in which the girls get together after luncheon and for fifteen-minute periods during the morning and afternoon.

Since the installation of these very attractive lunchrooms and the rest rooms the labor turnover at the plant of this telephone company has very materially decreased. In fact, it is figured that the cost of installing these conveniences has been more than paid for within six months after their installation by the decreased cost of breaking in new employees.

Isn't there a hint in all this for other employers who are seeking methods of making feminine employees more contented?

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St. Pierre Western Union Cable Station

About twelve miles from the southern coast of Newfoundland the archipelago of St. Pierre and Miquelon rears its high bleak hills, constituting the sole remnants of France's North American snow-clad possessions. On the island of St. Pierre (chief residence) an important and extensively improved cable station of the Western Union Telegraph Company has been established. The main building of the station is a fine stone structure containing the superintendent's residence and operating room. The left wing is a wooden building recently enlarged, in which are situated the artificial line room, storage battery room, cloak room, mechanician's shop, testing room on first floor, superintendent's office, billiard-reading room and store rooms on second floor. The basement, also remodeled, provides suitable space for toilets, generators, engines and furnaces.

In the center of the operating room the duplex repeater table is installed. The new cable table is placed near two high windows at the extreme end of the office with recorder set and relays on one side, perforators and automatic transmitters on the other. The cable panel and switchboard conveniently contrived for rapid changes in connections are set up at the other end of the room. The current supply for the different circuits and lighting is drawn from storage batteries charged from generator direct coupled to a 12 HP bolinder oil engine. An auxiliary bolinder engine is also installed in case of emergency.

The cable hut, a stone building situated at Anse St. Pierre—about two miles and a half climb across the hills and very hard to reach in winter snowdrifts—provides landing for the company's cables. Good conditioned undergrounds lead these cables to the office.

The staff is as follows: F. H. White, superintendent; H. Hagen, assistant superintendent; A. Gardner, electrician; J. Hagen, W. Riggs, A. Bartlett, G. Norgeot, F. Eloquin, B. Parsons, M. Lehors, A. Treich, J. Plante, A. Legentil, E. Fontaine, L. Hardy; training school, M. Campot, J. Hamel, E. Pichon, N. Girardin, C. Girardin, E. Delisle, C. Ozon, L. Albisthur; domestic, R. Plante (charge of branch office), J. Bry (messenger), G. Roblot (messenger); plant, T. Hebditch (plant assistant), A. Delamaire (motorman).

In spite of an exceedingly rigorous climate and a monotonous life, the members of the Western Union Cable Staff are a happy and hospitable group, loyal to the interests of the company, ready at any time for emergency service, and always bearing in mind that their valuable profession covers the world and serves all people.

Be a Gloom Chaser

Societies have recently been formed in the South and Middle West under the somewhat formidable name of "Noble Order of Gloom Chasers."

The object is to preach optimism at all times. The dues, it is stated, are "one smile a day," and each member is required to take the following obligation:

"I smilingly agree to support actively the constitution and by-laws, the purpose and intent of the Noble Order of Gloom Chasers, in letter and spirit, until my gloom is banished. Old Man Gloom shall never enter my office or workroom again, so help me Gloom Chasers. I am a Gloom Chaser until death do us part."

It is a great, great thing to be a chaser of gloom. There can be no greater ambition than to make people happy. There are too many heartaches and streaming eyes and pitiful faces and thin, pleading hands.

Do You Believe It?

To ears trained to distinguish differences in pitch, telegraph wires are said to constitute excellent weather prophets. A station master was recently quoted in *Uber Land und Meer* as making the following statements drawn from experience. The quotations are from a translation in *The Scientific American* (New York):

"Predictions as to the state of the weather can be made twenty-four to thirty-six hours in advance by a proper appreciation of the pitch, strength and quality of the tones produced by the wires. In particular, rain, snow and storms can be foretold with considerable certainty. In winter the tones are considerably higher than in the summer, since the tension is increased by the cold. High, shrill notes precede heavy but brief falls of rain or snow, while deep, humming tones indicate rainfalls which are both brief and light. Buzzing tones indicate a change in the weather; indefinite soft, humming tones of medium strength indicate a longer continuance of damp weather. It is naturally difficult to describe the tones with precision in mere words. They must be heard repeatedly in order that the mind may form consciously or subconsciously an idea of the weather condition to which they correspond. At any rate, the station master's prediction of a heavy storm upon the day following the interview proved entirely true."

What It Costs to Telegraph in Germany

It costs less to make a round trip from Germany to the West Indies, including meals, before the war than it costs to send a ten word cablegram today under the new rate just announced.

The cost of telegrams in Germany have been increased 33 per cent., while the rates on messages to America have been tripled. To some countries the increase is as high as 500 to 600 per cent., as in the instance of ten words to the island of Curacao. Such a message costs 1,140 marks, which is a higher sum than paid for a first class round trip steamer ticket before the war. Of course, the increasing costs is due entirely to the depreciated currency.

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY.

By Louis Casper.

Lesson 26

Comparison of Direct and Alternating Current Problems

Direct Current:

There are always three things present or to be taken into account in considering the operation of a direct current circuit. They are so bound up with its existence, as known to us, that we cannot eliminate any of them. The first one is current intensity, which is due to the second one, electromotive force, acting against the third one, resistance. They are indicated in formulas by the respective letters I for current intensity, E for electromotive force, and R for resistance.

Following out, therefore, the principle of Ohm's law, which is to the effect that current intensity is equal to electromotive force divided by resistance, the statement expressed as an algebraic equation becomes:

$$I = \frac{E}{R}$$

The statement may be transformed to read: the resistance is equal to the electromotive force divided by the current. In algebraic form this is expressed as:

$$R = \frac{E}{I}$$

Finally, Ohm's law may be stated thus:

The electromotive force is equal to the resistance multiplied by the current intensity, and is shown in an equation as: $E = RI$.

This states that with constant resistance, the current intensity varies with the electromotive force; and that with constant current intensity, the electromotive force varies with the resistance.

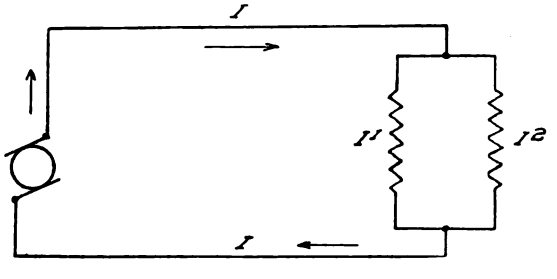

FIG 65

In connection with the study of Ohm's law, it would be desirable to include with it a brief understanding of Kirchoff's laws, which are extensions of Ohm's law in their application to direct currents:

1. When a circuit branches, the current in the main circuit is equal to the sum of the currents in the separate branches. For example in Fig. 65, $I = I^1 + I^2$.

2. (a) When two or more sources of electromotive force are connected in series, the total electromotive force is the sum of the individual electromotive forces. For example (Fig. 66):

$$110V + 50V = 160 \text{ Volts}$$

3. (b) When an electromotive force acts on a number of elements or things in series, it is subdivided into parts, each of which acts upon one of the elements; and the sum of these parts is equal to the total electromotive force. For example, assuming that a single Morse circuit (consisting of the line wire and 20 relays in series therewith) has an e. m. f. impressed upon it represented by 160 volts at each terminals, then, neglecting the resistance of the line proper, each relay would be acted upon by $20 \div 320$ of the total e. m. f., or 16 volts.

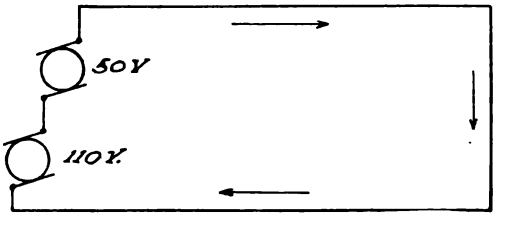

FIG. 66

Alternating Currents:

In alternating current operation the student is likewise concerned with the relations between current intensity, electromotive force and resistance. These relations are determined by the application of the same fundamental laws as in the case of direct currents, but in somewhat modified terms to conform to the constant changing values of both current intensity and electromotive force.

Every circuit in which the current alternately changes its polarity (whether regularly, or in the manner of a tape controlled Wheatstone or Multiplex transmitter) contains, we may say, four e. m. f.s (electromotive forces). The first, known as the *impressed* e. m. f, is that produced by the motor-generator or storage battery for delivery at the apex between the main line and artificial branches. Whenever this impressed e. m. f. acts upon a closed circuit it develops a current therein, and this current gives rise to three other e. m. f.s, one of which is known as the inductive or counter e. m. f. of self induction; another as the condensive or counter e. m. f. of capacity, and the third as the resistance drop or counter e. m. f. of resistance. The resistance drop is often spoken of as the *"effective"* e. m. f. These counter forces are present to a greater or lesser extent on all circuits.

The inductive e. m. f. always acts to oppose or retard the effect of the impressed e. m. f. While the current which follows the rise of the impressed e. m. f. is increasing in amplitude, the inductive e. m. f. retards such amplification. When the current is falling, it tends to hinder this fall. It thus

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affects the phase relation between current and impressed e. m. f., causing what is termed a "lagging current." It also lessens the effect of the impressed e. m. f., and if we subtract the inductive e. m. f. from the impressed e. m. f. we obtain the *working* or *effective* value of the initial force of the motor-generator or storage battery as the case may be.

The condensive reactance tends to neutralize the effect of the inductive e. m. f. It *facilitates* the flow of electricity at the time that the other *hinders* it, and in order to find the true effective e. m. f. we must take the *vector* difference of the impressed and counter e. m. f.s of inductance and capacity. It is this effective e. m. f. which really counts, and determines the current in a given circuit.

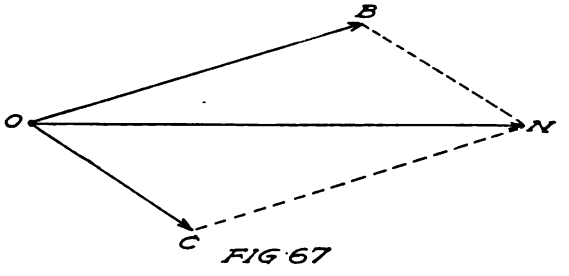

FIG 67

A brief explanation is herewith given outlining what is meant by a vector difference of two forces.

A vector diagram is shown in the form of a parallelogram. A line drawn between two opposite corners of a parallelogram (see Fig. 67) is called a diagonal; thus ON is a diagonal. It is along this diagonal that a body would move if pulled in the direction OB by one force and in the direction OC by another, the two forces having the same relative magnitudes as the relative lengths of OB and OC. Applying this principle to the subject under discussion, we will suppose two quantities represented by two lines OB and OC drawn from a common center at an angle with each other and one longer than the other. They would indicate two quantities out of phase with each other, and one greater than the other. They would form two sides of a parallelogram whose diagonal ON from the origin O outward would be their resultant, and would represent the combined effect of both quantities.

A further application of a vector diagram may be shown in which one of Kirchoff's laws for alternating currents is exemplified: "When an alternating current circuit branches, the 'effective' current in the main circuit is the 'geometric' (or vector) sum of the 'effective' currents in the separate branches."

A pole changer and battery (Fig. 68) supplies an effective a. c. current of I amperes in the main circuit, which divides into two branches I^1 and I^2, respectively. The relation between I^1 and I^2 is shown in Fig. 68. The angles A^1 and A^2 depend upon the relative values of the resistance, condensive and inductive reactances of the respective branches.

These latter forces will be gone into in further detail in the next lesson.

GREEK LETTERS

There are certain Greek letters that are largely used as symbols in the study of alternating current phenomena, some of which are given here as an aid to a better understanding of the latter.

π. This is the Greek letter p. It is best pronounced "pi." It indicates the factor by which the diameter of a circle must be multiplied to give the circumference. For approximate calculations its value may be taken as 3 1/7. If decimals are to be used 3.1416 or 3.14159 may be employed, the latter being accurate enough for almost any purpose.

The exact value of π. has never been calculated. It has been deduced to over a hundred places of decimals.

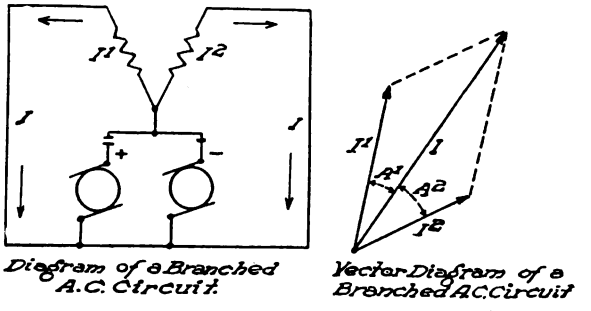

FIG. 68.

θ This is the Greek "th" or theta, a double letter as we would call it in English. It is used a great deal in alternating current calculations to indicate the angle of lag of either e. m. f. or current.

Φ This is the Greek "ph" or "phi." It is used to indicate the angle through which an alternating current wave has advanced from the O° position. When vector diagrams are used, the measurement begins from the right hand end of the horizontal diameter.

ω. This is the Greek o (long). It is spelled "omega" and pronounced as spelled. It is used to indicate the frequency of alternating current in radians per second. Let f equal the frequency per second of the alternations of a current, then

$$\omega. = 2\ \pi. \times f.$$

(To be continued)

Wireless Telephony

Advance in wireless telephony during the last year has been small, says the London *Electrician*, probably because the demand for it is really less than the popular imagination would have us believe. Changing over from sending to receiving is still a bar to proper conversation, and there is a real need for an efficient duplex system. Popular interest has been roused by high-power wireless telephony tests over long ranges, and these, it must be admitted, have had some scientific as well as advertising value.

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EDITORIAL COMMENT

Amplifying the President's Voice

When President Harding on March 4th began reading his inaugural address it was immediately noticeable that he was heard by the 125,000 people present. In previous years, even those who were not fortunate enough to get within 100 feet of the inaugural stand couldn't hear the speaker—they merely saw his lips and noted his actions, but this time all heard and understood. Whenever President Harding came to a passage in his speech that brought applause, the applause came from all parts of the crowd at the same time. In this, Mr. Harding was having an experience unknown to former Presidents. Heretofore, the applause was started by those at the front, who actually heard, and then travelled back by the psychology route.

The reproduction of Mr. Harding's voice by the Bell loud speaker was so perfect that those in the first rows could not tell where the natural voice left off and where the amplified voice began. If one could have walked away in a straight line from the platform, he could have detected no break in the tone, and but small variation in the volume. On the outskirts of the crowd the sound was as clear as in the first row. It was a perfect demonstration of the new art of voice amplification.

There was no doubt that the Bell loud speaker was a marked success at the inauguration.

Numerous comments were heard, all in praise of the wonderful clarity with which the President could be heard, and more than one person was heard to say that the telephone company had helped to make the occasion one to be long remembered.

The plant consisted of a system of motors, generators, wires, transmitters, amplifiers, and other electrical equipment, weighing several tons and filling three rooms, and it was most delicate machinery, requiring the utmost care in its operation. A drop of water at a given point, or a piece of metal the size of the head of a pin in the wrong place, would have put the whole plant out of business.

Old Time Telegraphs

To the cities of Lockport and Buffalo belong the honor of being one of the first localities to utilize the telegraph for commercial purposes. Orrin S. Wood, the first pupil of Professor Morse, built one of the first business telegraph lines in America between Buffalo and Lockport, which opened for traffic November 7, 1845.

The Buffalo office was in the basement of the Mansion House and the manager was Samuel P. Carter. The tariff was twenty-five cents for twenty-five words, and the first message sent announced the victory of the Whigs in Niagara County.

The New York, Albany and Buffalo Telegraph Company built its lines in sections, and the whole was completed in September, 1846. The first daily press report was sent over this line to a federation of State papers January 1, 1847.

In 1851 there were over fifty telegraph companies in the United States. In 1855 the New York and Mississippi Telegraph Company, organized in Rochester to build lines in western states, absorbed the Erie and Michigan Telegraph Company, and assumed the name of the Western Union Telegraph Company.

In the issue of April 16th, in commenting on the Western Union Telegraph Company's annual report, a comparative statement of the income accounts for 1919 and 1920 was given, and it was stated in the article that the Western Union Company's gross income for 1920 was nearly double that of 1919. Our attention has been called to the fact that the Western Union Company's published income accounts for the year 1919 and 1920 are not comparable, as the land line system transactions were under United States Government control until July 31, 1919, and any deductions drawn from a comparison between these two years would be misleading.

Secretary of State Charles E. Hughes is making an effort to have the French Government change its rules, so as to permit American cable companies to deliver cablegrams from the United States direct to French addressees instead of having them turned over to a French company for delivery, as has been the practice in the past.

Motor Pole Raising

A motor truck now being used in line construction work seems to be accomplishing splendid results. The truck is equipped with a horizonal winch operated from the truck engine, and is used for raising forty-foot poles.

Recently a speed run record was made of raising forty poles and setting them in their holes in one hour. This record was made on a stretch of country road where the holes had already been dug and the poles distributed. The truck is a three and a half tonner.

This service truck operates with a crew of three men, and is capable of doing four or five times the amount of work with three men that was previously done with six.

Removal Notice

The International Cable Directory Company, formerly located at 17 State Street, will hereafter be located at 15 West Thirty-seventh Street, New York. The International Cable Directory Company issues the Western Union Telegraphic Code, five-letter edition, as well as the Western Union Telegraph Code, Universal Edition.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.

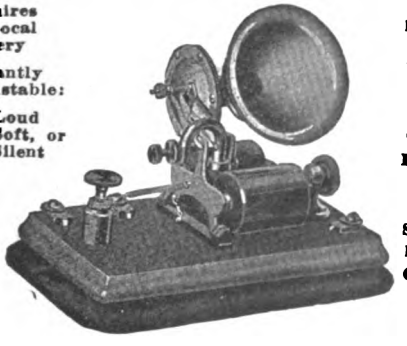
1205 Hobart Bldg., San Francisco, Cal.

2044 Railway Exchange Bldg., St. Louis, Missouri.

DIAPHRAGM *Telegraph Sounder*

Requires No Local Battery

Instantly Adjustable: Loud Soft, or Silent



Black Enamel Horn

Trouble Proof

Saves Battery Cost

Always Dependable

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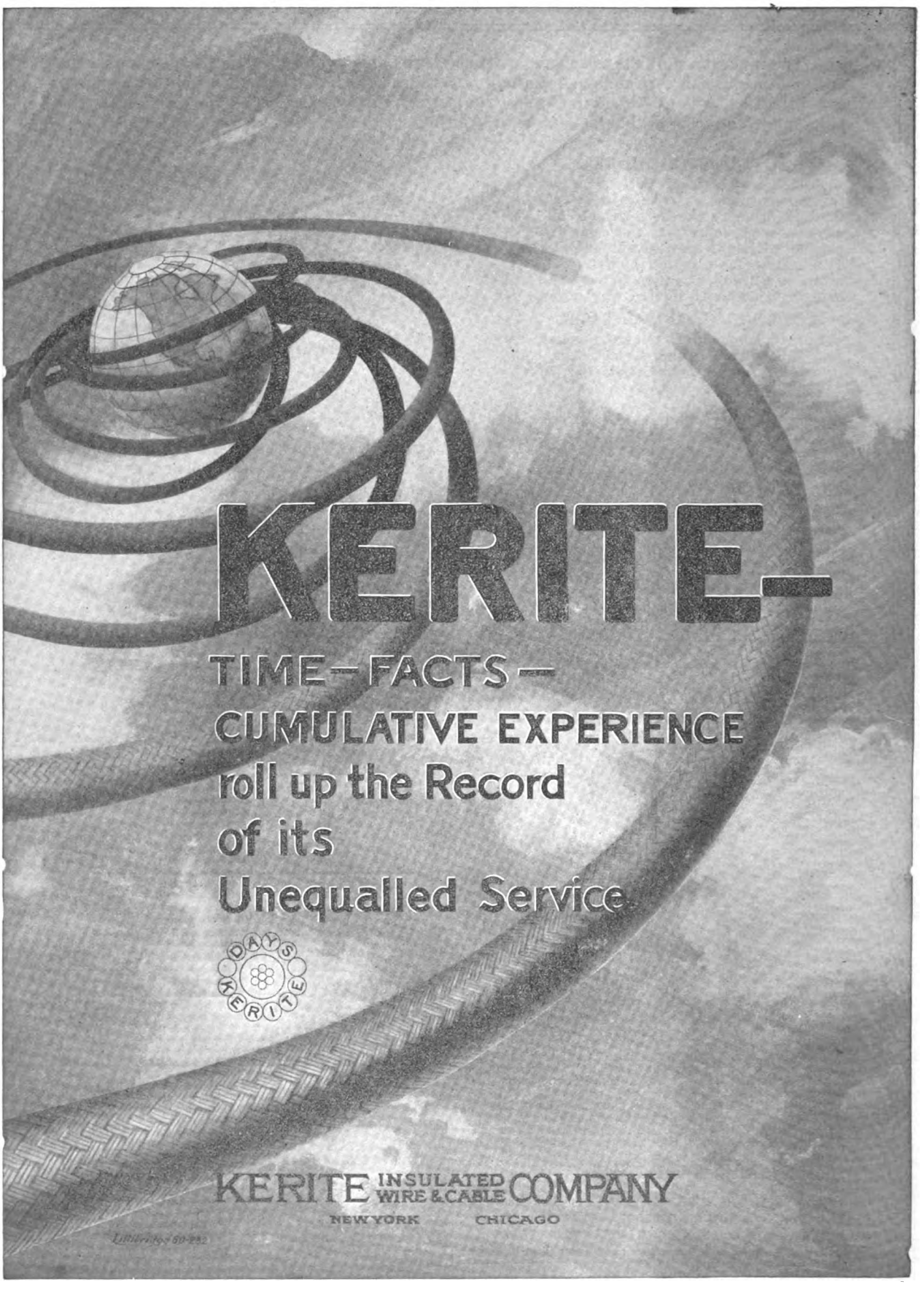

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THE RAILROAD

Demonstration of Carrier Current Telegraphy and Telephony

On April 18th a demonstration of Carrier Current Telegraphy and Telephony was given by the American Telephone and Telegraph Company at Harrisburg, Pa. B. A. Kaiser, representing the telephone and telegraph company, New York, accompanied the party to Harrisburg.

The demonstration was given under the supervision of O. B. Blackwell, L. Espenshied and H. Affel, engineers of the research department of the American Telephone and Telegraph Company.

Among the railroad telegraph and telephone officials present were: George A. Cellar, J. A. Jones, and I. C. Forshee, Philadelphia; E. C. Keenan, Stanley Rhoads, and E. C. Bowman, New York; H. A. Shepard, New Haven; L. Behner and W. M. Post, Pittsburgh.

Ten telegraph carrier circuits on one pair of wires between Harrisburg and Chicago; four carrier circuits on another pair of wires between Harrisburg and Chicago, and four carrier telephone circuits on one pair of wires between Harrisburg and Detroit were inspected. All of these carrier circuits were in practical service, some of them being leased wires for various commercial activities. The transmission of both the telegraph and telephone were marvelously good. In fact, the telephone transmission by the adjustment of the incoming voice currents can be made as illuminous and clear as desired by manipulation of the equipment controlling the high frequency carrier currents. The demonstrations were all successful and convincing, and made a decided impression on the visitors because of their flexibility and reliability.

The superintendents of telegraph and telephone of the New York Central Lines met in New York on April 27th and 28th to talk over matters of benefit to the service. Among those present were W. L. Connolly, Chicago; J. J. Ross, Detroit; B. J. Schwendt, Columbus, Ohio; G. A. Kirley, Boston, and R. F. Finley, Cleveland, Ohio, besides E. C. Keenan, general superintendent, A. B. Taylor, superintendent telegraph, and Stanley Rhoads, telegraph and telephone engineer, New York.

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Marconi Company to Operate Posts and Telegraphs

By agreement with the Peruvian Government, Marconi's Wireless Telegraph Company, Ltd., will, on May 1st, take over and operate for a period of twenty-five years the whole of the postal, telegraphic and wireless services of Peru, receiving as remuneration 5 per cent. of the gross receipts of the services and 50 per cent. of the annual profits. Sir William Slingo, late engineer-in-chief of the British Post Office, who was commissioned by the Marconi Company to examine the postal and telegraph situation, has accepted the position of chief of the department, and will act in this position on behalf of Marconi's Wireless Telegraph Company, Ltd. The postal and telegraphic conditions in Peru are of great interest. Of the approximately 9,000 miles of telegraph communications some exist at a height of 16,000 feet, notably where crossings are made of the Andes, and of the 42,000,000 odd words telegraphed annually, a considerable percentage has consisted in the past of traffic for Government departments, which has been handled without payment. The concession to the Marconi Company includes the sole and exclusive operation of all international wireless telegraph stations within the Peruvian Republic, the exclusive right to erect any further wireless stations that the company may think necessary, and the sole and exclusive usufruct in the case of all Peruvian telephone services, except the few local ones already existing. It is believed that the modernization of the posts and telegraphs, and their operation by a commercial company, will lead to a remunerative business, and that with the wider use of wireless telegraphy, especially over the forest and southern areas, a large increase in traffic will be recorded, and a corresponding impetus given to the development of trade. *The Times* states that the foreign personnel under the Marconi administration is limited to 20 per cent. of the total employees, and the Marconi Company is to advance the requisite funds for the reorganization of the services at an interest rate of 9 per cent. It is expected that this advance in the first year will amount to £200,000 sterling.—*London Electrical Review.*

—o—

J. L. Ferciot, district commercial manager of the Western Union Telegraph Company, at Omaha, Nebraska, at a meeting of commercial managers held recently at Wichita, Kansas, had this to say, which is well to remember: "Business has not been having hard times, and hard times are not coming. It is merely the passing of soft times. The firms that go after business get it. The telegraph company is a barometer of this thing. Our meeting of managers have a twofold purpose—to re-energize our staff of employees, remind them of their obligation to the public, and of the importance of telegraphic service in the business world. We are attempting to leave no stone unturned to discharge our duty to the public and everywhere we are finding business men most receptive."

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Reliable Protection Products Produced in New Factory

Ten years of progress is marked by the Reliable Electric Company in establishing itself in a newly-erected, modern, one-floor factory. The new plant into which the company moved last July is located at 3145 Carroll Avenue, Chicago, in the west side manufacturing district.

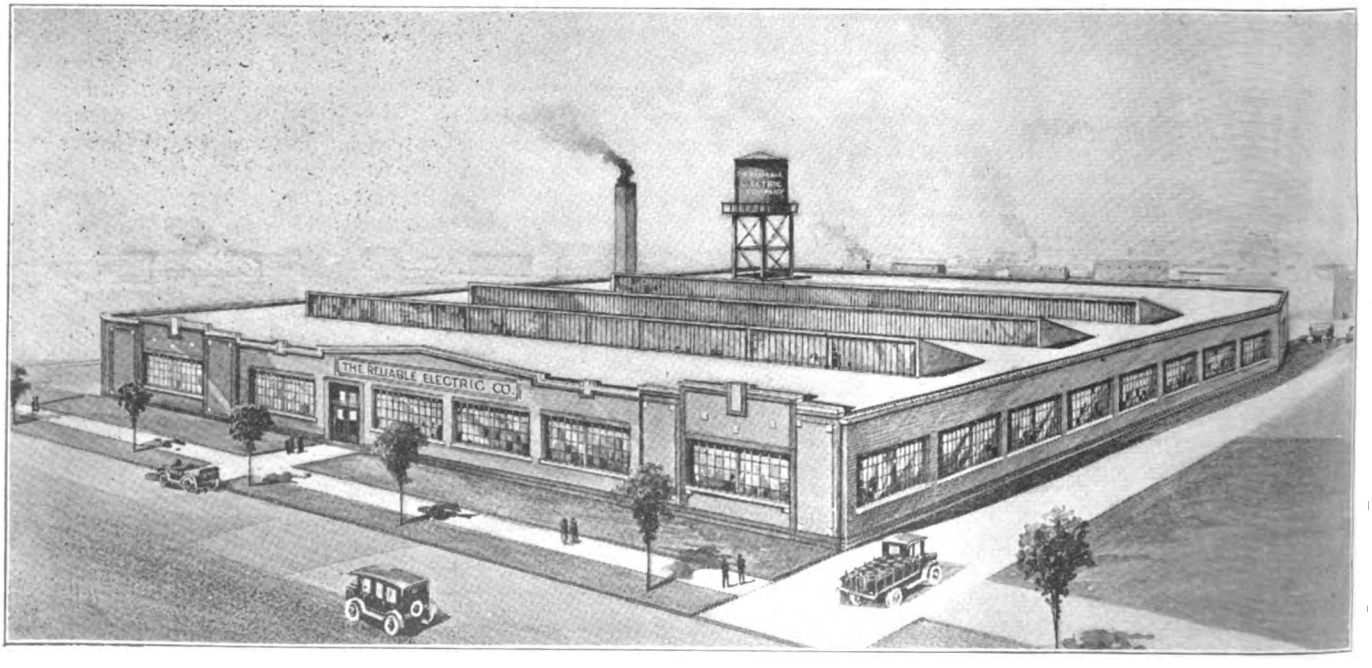
The building is 136 feet by 150 feet, one story in height, and with sufficient land on the east of it to practically double its size. The factory faces north and the working forces are located along the north and west sides of the building, which are, as is the case with the modern type of manufacturing plants, practically all windows. The entire single floor is, moreover, well lighted by means of saw-tooth skylights which admit north light only, the best kind of light.

The accompanying illustration gives an excellent idea of the construction and appearance of the building. The receiving and shipping doors are located at the rear. The stockroom for raw material and parts is in the east part of the building, convenient to the receiving doors.

W. L. Cook

Geo. W. Rodormer

John Perry



New Plant of Reliable Electric Company

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Of course, efficiency methods prevail in the Reliable factory, waste motion being eliminated so far as is possible. Raw material, leaving the stockroom, progresses from one machine to another in a direct course until it reaches the packing department, and is then either placed in stock or shipped to the customer.

The removal into the new factory was also marked by the installation of several new and the most modern machines, which greatly add to the productive capacity.

The production of Reliable products is under the general direction of W. L. Cook, president of the company, with John Perry in direct charge of factory production. Mr. Perry has had years of experience in manufacturing, and while cautious in making promises as to the amount of output, usually exceeds the expected quota.

Mr. Cook has a wide experience and acquaintance in the telegraph, telephone and electrical fields, and is a frequent visitor among telegraph officials in New York City. Educated as an engineer, he after several years in engineering work, followed sales engineering and has also been engaged in manufacturing. He is thus familiar with the requirements of his telegraph customers.

George W. Rodormer, secretary and general sales manager of the company, has an exceptionally wide acquaintance among telephone men, for he has been calling on them for about twenty years, and during all this time he has sold sleeves, fuses, and other protective equipment only. Naturally, there are not many things about protective equipment that Mr. Rodormer does not know.

As previously indicated, the success which the Reliable Company has so far attained has been due to the efforts of Mr. Cook and Mr. Rodormer. With the modern equipment and methods which are installed in the newly-built factory, the Reliable company in the next ten years should make greater progress than it has in the last decade.

Among the important products of this company which the telegraph, the telephone and the railroad are interested in include lightning arresters, copper sleeves, sawtooth discharge blocks, knife switches, and fuse contacts.

Censorship Off News Sent Over Naval Wireless

Removal of all censorship restrictions over press dispatches transmitted by naval radio was announced by the Navy Department on March 29th.

In the past, under an order issued by the previous administration, the department has reserved the right to hold up dispatches containing matter considered by the naval authorities to be inimicable to the United States' relations with other nations and to send the objectionable sentences back to the department for the approval of or rejection by the Secretary of the Navy.

The March 29th ruling disclaims that the mere transmission of the messages, either press or commercial, by naval radio implies official government sanction of the contents.

Wireless Fog Signals to Be Installed at Entrance to New York Harbor

The Secretary of Commerce announced a few days ago that in view of the important development of a radio compass by the Bureau of Standards, three wireless fog signals would be immediately installed at the entrance to New York Harbor. Each of these three stations is equipped with an automatic radio set sending out signals continuously during fog or thick weather. These signals may be picked up on shipboard by means of the new radio compass, which indicates the direction from which the radio signals are sent out, and by taking observations on the different stations, the captain of a vessel may determine his exact position without being obliged to rely on the former unsatisfactory method of locating himself by the sound of whistles and fog horns.

These signals have been developed as the result of co-operative experiments by the Bureau of Standards and the Lighthouse Service, and more especially through the research work of the Bureau of Standards in improving the radio compass. It differs from all other systems in use for determining radio direction in that the navigator himself can determine radio bearings, just as he uses his magnetic compass for bearings in clear weather, and he does not have to depend upon expert radio operators. The other advantage is that the sending apparatus is easily installed and can be operated by the regular light keepers without any skilled personnel, and that any number of vessels at sea equipped with radio compasses may obtain their position at the same time without interference.

THE Argentine Government has granted a thirty-year concession to the General Wireless Telegraph Company, of Paris, to construct on the Argentine coast a wireless telegraph and telephone station to communicate with France and other European countries.

Be an Authority on the Telegraph

"Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, offers the most complete study of the telegraph ever published. This standard text-book has been revised and brought up to date, and in addition to numerous diagrams and complete information covering the study of the telegraph, includes full descriptions of the newest apparatus adopted by the Western Union and Postal Telegraph companies, and the equipment of a modern telegraph office. This valuable book, with its 488 pages, 250 illustrations, and carrying an appendix of 24 pages and 16 illustrations covering the new Western Union Multiplex System, is the most sought after electrical book on the market. $2.50 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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Broad Street, New York, as a Cable and Radio Center

Broad Street, New York, is a veritable submarine cable and radio telegraph center. From this short street are ends of submarine cables that reach almost all sections of the world, and it is doubtful if in so small a space, even in London, can be found cable and radio facilities of equal importance.

The Commercial Cable Company is established in its own massive handsome structure at No. 20 Broad Street, adjoining the Stock Exchange. Here are the terminals of five transatlantic cables; cables direct and via Miami to Havana, Cuba, and via Bermuda to the West Indies, and the special direct line to San Francisco, connecting with the Commercial Pacific Cable to the Philippines, China and Japan.

All cables are equipped with modern high speed apparatus and supplemented wherever possible by land lines to preserve continuity of service in the case of mishaps to the ocean cables.

The French Cable System is located at 25 Broad Street. The facilities consist of three cables to Brest, France, one of them direct from New York through an automatic relay at Fayal, Azores; two to Orleans, Cape Cod, Mass.; one from there direct to Brest, and the other via St. Pierre, Miquelon, to Brest. The United States and Hayti Telegraph and Cable Company headquarters also being located at 25 Broad Street, facilities consist of a cable from New York to Cape Hayti.

The Western Union Cable System is located at 38 and 40 Broad Street. The facilities consist of eight transatlantic cables. Four from Valentia, Ireland, to Hearts Content, N. F., one from Ballinskelligs, Ireland, to Harbor Grace, N. F., and three from Penzance, England, to Bay Roberts, N. F. From Hearts Content to North Sydney, N. S., there are five cables; from Bay Roberts, N. F., to North Sydney one cable; from Harbor Grace, N. F., to Halifax, N. S., one cable; from Bay Roberts, N. F., to New York City, three cables, one of them via St. Pierre, Miquelon, and from North Sydney to New York one cable. Between North Sydney and New York there are a multiplicity of land line connections, all of which circuits are now operated by syphon recorders. There are three cables to Havana, two of them worked multiplex, one being a three-channel multiplex, and the other a two-channel multiplex, and the other cable operated by a Morse duplex. The cables land at Key West and Punta Rassa, Fla., a multiplicity of land lines connecting these cable stations with the Central Cable Office, New York. All of the Western Union transatlantic cables are worked with amplifiers, which increase the output approximately 50 per cent.

The Radio Corporation of America is located at 64 Broad Street. The facilities consist of direct duplexed radio circuits to England, Norway, Germany and France. Direct radio communication with Italy will probably be established before the end of the present year.

The All America Cable System is located at 89 Broad Street. The facilities consist of two direct cables to Colon, Isthmus of Panama, via Fisherman's Point, Cuba, thence across the Isthmus to the western coast of South America. The New York office works direct with Buenos Aires, a distance of about eight thousand miles. The cables are worked duplex.

Canadian National Telegraphs

THE resignation of D. E. Henry, treasurer, Canadian National Telegraphs, Toronto, Ont., as a result of ill-health, took effect on April 1st. Mr. Henry entered the service of the Great North Western Telegraph Company under the late H. P. Dwight, former president and general manager, twenty-two years ago, and had been continuously in the company's service since that time. Upon the appointment of George D. Perry as general manager in March, 1911, Mr. Henry was promoted to the position of treasurer, which position he held until the time of his retirement. Mr. Henry carries with him the best wishes of his co-workers for a speedy recovery. He is succeeded as treasurer by J. F. McTaggart, formerly traveling auditor of the company.

ONE of the worst blizzards ever experienced in Western Canada started in the vicinity of Winnipeg on April 5th, and continued for three days. On Friday the storm had ceased, but a high wind developed on Saturday which played havoc with the lines still heavily laden with ice and snow. Practically all telegraph and telephone lines south and west of Winnipeg were interrupted. Regular communication between Winnipeg and the East was maintained continuously, and also with Regina and points west by way of Vancouver, Seattle and Chicago, until April 11th, when by the vigorous efforts of the plant department all important circuits were restored. The difficulties of maintaining lines under such conditions will be fully appreciated by those who have witnessed a three-day blizzard in the prairie provinces.

ANOTHER severe sleet and wind storm occurred in Southeastern Ontario April 16th and 17th. Wire companies generally suffered to a considerable extent, but the Canadian National Telegraphs, while losing about one hundred poles, were put to very little inconvenience, all their main routes being practically intact on Monday morning. The storm seems to have been particularly severe in the vicinity of Stratford, Ontario.

THE appointment of J. Stevens as chief operator, Canadian National Telegraphs, Regina, Sask., took effect April 1st. Mr. Stevens had been chief operator for the Grand Trunk Pacific Telegraphs at Regina prior to the amalgamation.

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A Problem in Electrical Engineering to the Editor of Telegraph and Telephone Age

Dear Sir:

A little problem in Electrical Engineering was presented to the writer several years ago, and it has been suggested that it would be a suitable one to submit to students to test their knowledge of circuits. The device was to be employed in a coal conveying system. It was required to install a signaling arrangement between three stations *A, B, C,* of which *B* was the intermediate station. Signaling was to be carried on by code signals, as follows: *A* must be able to ring a single stroke gong at *C*. *C* must be able to ring a similar gong at *A*, each without ringing his own gong. *A* and *C* in signaling one another must also ring a gong at *B*. *B* must be able to ring *A* and *C* separately—that is, in ringing *A* he must not ring *C*, and vice versa. Also in ringing *A* or *C*, *B* must not ring his own gong. The code method employed was somewhat as follows: One bell, "Stop Sending"; three bells, "Slow down," etc. It was also desired that the intermediate station *B* should understand the meaning of the signals exchanged between *A* and *C*. It may be added that the method adopted to carry out the foregoing requirements has been in successful operation for about ten years. The necessary apparatus for the arrangement can be obtained through any telegraph supply house. There are, of course, several ways in which the thing can be done, but, naturally, the simplest is desirable.

Yours truly,

WM. MAVER, JR.

The editor will be pleased to receive solutions of the problems, if it can be called a problem. One and perhaps more solutions will be published in an ensuing issue. If more than one solution is offered the correspondent might mention his preference and reason therefor.

Cable Staff Banquet, St. Pierre Miquelon

The Hotel Joinville of Saint Pierre was the scene of a very pleasant gathering recently, when the employees of the French Cable Company and the Western Union Cable Company and their families met to celebrate their annual staff banquet. The dinner was a specimen of French culinary art set off with dainty French wines. A. Coste, superintendent of the French Cable Company; Madame Coste; F. H. White, superintendent of the Western Union Cable Company, Mrs. White, Miss White; Doctor Dupuy-Fromy and Mr. Thomson (North Sydney staff) were guests of the respective staffs. Among others in attendance were H. Hagen, assistant superintendent of the Western Union Cable Company, Mrs. H. Hagen, Jas. Hagen and Mrs. J. Hagen, T. Davis, clerk in charge of the French Cable Company, Miss Davis, H. Dagort, Madame H. Dagort. At the end of the dinner A. R. Bartlett, in the name of the Western Union staff, made an address in French. Jean Guillaume of the French Cable Company replied to the Western Union greetings.

After singing the French and British anthems, the company adjourned to the ballroom, where in a short time lively quadrilles, polkas, etc., were in full swing, adding renewed pleasure to a very successful evening.

Western Union Charges Plot

A female receiving clerk and two male operators in the Los Angeles, Cal., office of the Western Union Telegraph Company were arrested on April 6th, charged with the filching of about $30.00 a day from the company. The receiving clerk kept a receiver's register of messages, on which she marked the serial number of the message and the amount received. Every so often she duplicated these numbers on different messages, made a note of them, and kept the money received, not entering the message on the receiver's register. Then she sent a list of the messages for which she kept money to the two operators in the operating room, and they destroyed the messages after they had been sent. The plan was upset when a customer asked to have a telegram repeated.

When the young woman was arrested, a list she had just prepared was in her possession. A similar list for a former date was said to have been found in one of the operator's possession.

The receiving clerk, who made a full confession, when she appeared in court, became hysterical, and those who saw the pitiable plight of the three wondered if it paid to take such chances. The trio will be tried on charges of grand larceny.

MORRIS L. WESCOE, an old time operator indentified with the railroad, the commercial and the radio and press telegraph service, died on April 4th. Mr. Wescoe was at one time manager of the Bethlehem, Pa., office of the Western Union Telegraph Company. He worked in the Central Cable Office and 195 Broadway, New York, as well as different brokerage firms. He was always interested in radio, and in 1903 went to South America and installed the first radio along the Amazon River. He was in Brazil a year in the interests of the National Electric Signaling Company, known as the Fessenden System. During the World War he was chief radio gunner in the United States Naval Reserve, working at the Radio Laboratory, Brooklyn Navy Yard, and also at Bay Ridge. He was a Spanish War veteran, and since the termination of the World War had been identified with brokerage firms. He is survived by his wife and a daughter.

OUR readers should remember that when they have occasion to communicate with advertisers, it is important that they mention TELEGRAPH AND TELEPHONE AGE. The advertisers appreciate this courtesy.

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PERSONAL

F. B. JEWETT, chief engineer of the Western Electric Company, who is one of the best known engineers in the United States, has been elected a vice-president and a director of that concern.

WILLIAM MAVER, JR., electrical engineer, New York, accompanied by Mrs. Maver and Miss Jessie Maver, is in Bermuda on a few weeks' vacation.

MRS. MAUDE CLARK HOUGH, wife of Lt. Col. Ira D. Hough of New York, has been appointed chairman of the committee to provide a clubhouse for the convenience of the Brooklyn and Manhattan members of the League of American Penwomen. This will be the first league clubhouse east of Chicago, with the exception of the headquarters of the National League for American Penwomen at Washington. Mrs. Hough made a name for herself as an organizer through her war work in Washington, where she acted as chairman of the Patriotic Service Committee for the League of American Penwomen, representing the society in the Liberty Loan drives. She also took an active part in the Americanization work of Liberty Chapter, Daughters of American Revolution.

POSTAL TELEGRAPH-CABLE COMPANY

EDWARD REYNOLDS, vice-president and general manager of this company, and John Goldhammer and George Clapperton of the Commercial Cable Company, New York, attended the United States Chamber of Commerce meeting at Atlantic City, N. J., on April 26th.

J. J. WHALEN, traffic manager, and F. J. Kernan, auditor, New York, are still absent from their offices due to illness.

C. E. BAGLEY, superintendent, Philadelphia, Pa., has completed a trip of inspection covering offices at Baltimore, Washington, Wilkes-Barre and Scranton.

C. F. THOMPSON, wire chief, at Washington, who has been absent from the office for several months following a severe operation, made a short visit to the office a few days ago. The entire force was glad to see him.

THOMAS J. BURGESS, for years on the staff of the Associated Press, Albany, has been appointed manager at Lake Placid, N. Y. Mr. Burgess will have charge of the branches in the Lake Placid Club and the Stevens House.

MANAGER P. J. MACKEN, of Springfield, Mass., recently delivered an address to the students of the Commercial High School at that place on "The Telegraph Service of Today."

Managers Appointed

B. R. Morgan, East Liverpool, Ohio; E. G. Hardgrove, Barberton, Ohio; E. J. Ferree, Hendersonville, N. C.; L. A. Rowe, Bakersfield, Cal.; J. F. Logan, Pottsville, Pa.; Clyde L. Fendley, Fulton, Ala.; R. K. Smith, Montgomery, Ala., and J. D. Crawford, Stithton, Ky.

G. W. GRIME has been appointed acting manager at Pittsburgh, Pa., vice W. H. Bassett, who resigned to go into business for himself. Mr. Grime has been in charge of the branch office in the Stock Exchange in Pittsburgh for a number of years. He is succeeded by L. Kearney.

C. B. YOUNG, manager at Wilmington, Del., who has been absent on account of sickness, has returned to duty.

R. H. SNAKE is now in charge of the Philadelphia branch office in the Bourse Building, having been transferred from the branch at 49 South Third Street. D. Carlin succeeds to the management of the latter office.

S. SILVERMAN has been appointed branch manager at the North and Pleasant Streets office, Baltimore, Md.

A NEW office has been established at Shenandoah, Pa. Thomas Reilly is the manager.

A. S. WOOD, who has been doing good work at Houghton, Mich., has been promoted to the managership at Sioux City, Iowa.

A. G. HITCHCOCK has been appointed manager at Fayetteville, N. C. Mr. Hitchcock was formerly manager at Albany, Ga., and his friends welcome his return to the telegraph service. He relieves W. W. Garland.

C. S. WOOD, who has recently been in the brokerage business, has been appointed manager at Baton Rouge, La.

THE new office at Dallas, Tex., will soon be ready for occupancy. The company will occupy the entire three-story building. Jesse Hargrave is the superintendent.

THOMAS P. WHEELER, night traffic chief, St. Louis, Mo., celebrated his seventy-third birthday last Christmas. He has been identified with the Postal interests at that point since its inception and in the telegraph service since 1863. He was one of the finest operators of his day, and bids fair to a good account of his stewardship in the service for many years to come.

The Magnetic Club

The dinner of the Magnetic Club will take place at the Hotel Pennsylvania, Thirty-third Street and Seventh Avenue, New York, on Saturday, May 7th, at 6.30 P. M. The greater portion of the evening will be devoted to entertainment by professionals. The prices of the dinner tickets will be $2.00 for members and $5.00 for guests.

All acceptances should be in the hands of Joseph J. Cardona, treasurer, 253 Broadway, New York, not later than May 4th.

Article III of the Constitution was amended at a special meeting held on April 27th, so as to provide that membership in the club should hereafter be limited to employees of the Postal Telegraph-Cable Company and its affiliated companies. The

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admission fee was reduced from three to one dollar and the annual dues from two to one dollar.

The Magnetic Club is one of the oldest dining-out clubs in New York City, and its dinners have in the past been most enjoyable. A very decided sentiment in favor of renewing its social affairs has been apparent for some time, and everyone is now looking forward to the Spring dinner, with a determination to make it a distinct success. The entertainment committee, which will have charge of the dinner, is composed of the following members: James J. McDermott, Robert J. Hall, William J. Deegan, Phillip A. Hickey, William B. Dunn and Eugene P. Tully.

WESTERN UNION TELEGRAPH CO.

NEWCOMB CARLTON, president of the company, has been elected a member of the Board of Directors of the International Acceptance Bank, Inc., New York.

In order that the division traffic supervisory forces may acquire a broad experience, it has been the policy to make transfers from the general headquarters' staff to the field forces and vice versa. In carrying out this policy, the following changes will become effective as of May 1, 1921.

The traffic organization is slightly changed by establishing the position of general superintendent of traffic, with headquarters at 195 Broadway, New York. Division traffic superintendents shall report to the general superintendent of traffic instead of to the vice-president in charge of traffic, as at present.

J. J. Welch is appointed general superintendent of traffic, headquarters, New York.

S. B. Haig is appointed general supervisor of traffic service, headquarters, New York.

J. P. Edwards is appointed division traffic superintendent, eastern division, headquarters, New York.

C. R. Fisher is appointed division traffic superintendent, lake division, headquarters, Chicago.

W. L. Glasheen is appointed division traffic superintendent, Pacific division, headquarters, San Francisco.

AT the annual meeting held on April 13th the old officers were re-elected.

E. R. SHUPE, general supervisor of Traffic Costs, of Vice-President Fashbaugh's office, New York, is visiting St. Louis and Chicago on business connected with the service.

J. R. BRADER, district commercial manager, Camden, N. J., is at present enjoying his vacation.

New York Western Union

COLONEL IRA D. HOUGH, assistant division traffic superintendent in charge of Greater New York, accompanied by Mrs. Hough, were guests of George D. Wilkinson, instructor of the Camp Alfred Vail, N. J., school the week-end of April 23rd.

JAMES ANNISMAN is at Atlantic City.

MISS MARGIE KING is on vacation.

THE bowling season of the Metropolitan Division, Western Union Bowling Association, came to a close recently at the Rational Recreation Alleys, Brooklyn. The tournament was won by the Commercial News Department team. Messrs. Bellis and Sugar, manager and captain, respectively, deserve praise for the showing their team made, as it was composed mostly of novice and inexperienced material. The team was composed of the following: Moyer, Walsh, Cooley, Law, Sugar (captain), Bellis (manager). The team finished in the following order: First, Commercial News Department; second, Cable Traffic; third, Accounting; fourth, Treasurer's; fifth, Valuation; sixth, Departmental; seventh, V. P. Plant; eighth, N. Y. City Plant; ninth, V. P. Traffic; tenth, Metropolitan.

THE baseball season is with us again, and the old familiar sound "play ball" was music to Doc Brewster and Sam Moyer, who take care of the Commercial News Department baseball service from the Polo Grounds and Ebbets' Field, respectively. Charlie Agnetti is the Commercial News Department representative at Jersey City Park. He also was wearing a smile when the season opened.

Eastern Division

S. B. WILCOX, former manager at Rutherford, N. J., has been appointed manager at Elizabeth, N. J.

OUR Scranton, Pa., staff is proud of the multiplex equipment which was recently placed in operation there. Scranton is the third municipality in Pennsylvania to have this equipment, Philadelphia and Pittsburgh being the only other cities in this State to be so equipped. Mayor A. T. Connell, of Scranton, was invited by the company to send the first message over the new apparatus, which invitation he accepted, and the following message sped on its way to Mayor John F. Hylan, New York: "The people of Scranton, the metropolis of the anthracite coal fields, send greetings over the Morkrum Printing Automatic Telegraph to the people of New York, the metropolis of the United States, and wish them a happy Easter season.—Alexander T. Connell, Mayor." C. C. Lever, district traffic supervisor from New York, was one of the interested spectators at the machine. J. J. Griffin, of New York, who has charge of installing the Morkrum machines, was also on hand, as were H. T. Denniston, of Rochester, who is to be assistant automatic chief operator at Scranton; W. H. Peterson, local chief operator, and W. H. Collins, local plant chief. At present the Multiplex in operation at Scranton is connected only with New York, but in a few weeks more equipment will be installed to connect with Philadelphia.

ON April 18th District Commercial Superintendent J. S. Calvert, Philadelphia, was honored

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by a visit from seven general managers of the company—Messrs. M. T. Cook, A. D. Bradley, A. B. Cowan, A. C. Cronkhite, F. A. Mohr, T. W. Carroll, and H. C. Worthen—who had been in attendance at an official conference in New York. It was indeed a pleasure to have them in Philadelphia.

On April 14th the Johnstown, Pa., office was completely destroyed by fire. Manager Kirk within a few hours established a temporary office with everything running smoothly.

Miss Maggie B. Duff, receiving operator on the Chicago grain wire for the Philadelphia Local Telegraph Company, has been in active service for over fifty years, having been employed by the Delaware River Telegraph Company, which company was absorbed by the Western Union Telegraph Company in 1871. In 1873 she entered the service of the Philadelphia Local Telegraph Company, a subsidiary of the Western Union Telegraph Company, operating the ticker service in Philadelphia. Her record is indeed a fine example of efficiency and close application to duty, and this long, unbroken service is certainly one to be proud of.

G. K. Wilkins is acting manager at New London, Conn., vice F. L. Morrison, who is absent on furlough.

Offices were opened at the race tracks at Bowie and Havre de Grace, Md.

H. R. Morrison, Wilmington, Del., has been assigned to vacation relief work. A. A. Nourie has also been assigned to this class of work.

C. W. Saleski, chief operator at Bridgeport, Conn., recently met with a slight accident. His friends wish him a speedy recovery.

J. J. Bell, aged seventy-four years, identified with the bookkeeping department in the Chicago main office since 1880, died on April 9th. Mr. Bell was one of the popular men in the office. He was retired on pension in 1917.

A new office has been opened at Scotts Bluff, Neb. J. H. Mack, formerly in charge of the Grand Island, Neb., office, has been appointed manager.

Sol. S. Frank has been appointed manager of the Norfolk, Neb., office, vice B. Levine, resigned.

Philadelphia

The forthcoming dinner of the Dot and Dash Club, to be held at the Hotel Loraine, May 5th, promises to outdo any previous effort.

The auditors of the Electrical Aid Society of Philadelphia held its final meeting April 27th. At this meeting many things of interest were discussed. Frank E. Maize, manager of the Electrical Bureau of the City of Philadelphia, spoke at some length on the growth of his bureau, which is the largest and most efficient in this country. Many former telegraph operators hold important executive positions in Philadelphia's City Hall.

Radio Corporation of America

E. F. W. Alexanderson, chief engineer, returned from an extended trip to Europe on the steamer *Corona,* April 24th, during which he visited England, Germany and Sweden.

The Radio Corporation of America entertained Professor Albert Einstein and a party of famous German and American scientists April 23rd at its New Brunswick High Power Station for the purpose of demonstrating to the distinguished visitor and his colleagues the practicability of sending messages by high speed transmission. The visitors included Doctors Steinmetz, Langmuir, Berg, Duschman and Hull of the General Electric Company, Doctor Wilson of the Western Electric Company, Doctor Campbell and John Carson of the American Telephone and Telegraph Company, Doctor Goldsmith, David Sarnoff, C. H. Taylor and other engineers and officials of the Radio Corporation. A luncheon was served at Klein's Hotel, New Brunswick, after which the parties spent two hours at the high power station. Messages were sent through the station at the rate of fifty words per minute from the Broad Street Office, New York, direct to Europe, the signals being shown on oscillographs. For the benefit of the visitors messages were sent to four different European stations—Stavenger in Norway, Nauen in Germany, Carnavan in Wales, and Lyons in France. Professor Einstein sent a complimentary message to Nauen and received a reply from the officer in charge there in six minutes. He stated that he was astounded at the big scale on which Americans handled such problems in radio telegraphy.

All America Cables

On April 22nd the deferred rate cable service was resumed with Panama, Canal Zone, Colombia, Ecuador, and Paraguay.

All America Cables, Inc., announces the inauguration of week-end cable letter service from its New York office to the Central and South American countries.

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CONTENTS

Carrier Current Telephony and Telegraphy. By E. H. Colpitts and O. B. Blackwell. (Continued in part from page 195, May 1st issue) 218
Wireless Wheatstone Trials 219
The History of Vessel Reporting at Sandy Hook. By Wm. de la Motte, Red Bank, N. J. 220
The Federal Shanghai Radio Station. Concerts by Radio Telephony... 221
An Appreciation of Thomas Ahearn, Ottawa, Ontario..... 222
According to the Code. By Edwin Tarissee, Washington, D. C..... 223
Circuit Details of the Connector Switch. By Harry E. Hershey, of the Automatic Electric Company, Chicago 224
Pension Bill for the Relief of United States Military Telegraphers. Annual Meeting of the Associated Press 226
Radio Corporation of America. Dinner of the Dot and Dash Club.... 227
Student's Course in Technical Telegraphy. By Louis Casper. Lesson 27 228
All America Cables 229
Editorial—When Edison Speaks He Says Something. Appeal for Telephone Relics 230
The Railroad—Ampere Club Organized. President Given Control of Cables 233
Description of Ribohm. Our Steady Subscriber 234
Plain Tales of the Telegraph Lines—Ignominious Rout of the Growler Gang. By Robert Ellis 235
Electrical Facts Worth Remembering 236
The Magnetic Club Dinner. Telegraph and Telephone Life Insurance Association 237
Personal. Postal Telegraph-Cable Company. Commercial Cable Company. Magnetic Club of New York 238
Western Union Telegraph Company 239
Obituary 240

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Carrier Current Telephony and Telegraphy

By E. H. Colpitts and O. B. Blackwell

(*Continued in part from page* 195, *May* 1 *issue*)

Arrangements for Two-way Transmission. Thus far the discussion has been limited to transmission in one direction. Provision must be made, however, for associating these one-way channels with the connecting telephone lines so as to permit two-way conversation. In many aspects the problem resembles that encountered in adapting a one-way amplifying element to a two-way talking circuit by means of a telephone repeater. The similarity of the two problems consists not only in the fact that the carrier channel and the repeater element are both unilateral or one-way arrangements, but also that both involve amplification, and, therefore, the same possibilities of "singing" are present in the case of the carrier as in the case of the repeater. The experience, which was gained in the development and engineering of telephone repeaters, has proved of very great value in connection with the development of carrier current systems. For details of the various circuit arrangements, and for a discussion of the fundamentals of the repeater problem, reference may be made to the paper on telephone repeaters mentioned previously.

As in general it is desirable to be able to connect any telephone trunk or toll line to the section of line equipped for operation by the carrier current method, it is necessary to adopt for connecting these lines together a circuit of the type which has been studied for many years by telephone engineers, first, in connection with subbscriber sets, and, second, in connection with repeater circuits.

At either terminal of the carrier-frequency line, the sending and receiving branches, instead of terminating in a transmitter and receiver, terminate in what are, in effect, conjugate branches of an alternating-current bridge. If the impedance of the artificial line exactly simulates the impedance of the voice-frequency line looking outward from the carrier terminal, an electromotive force applied between the points *a* and *b* does not cause any current to flow in the branch *c-d* of the carrier current circuit. This represents a condition of zero coupling between the input and output circuits of the carrier system; hence persistent oscillations, i. e., singing, cannot be set up. If, however, the balancing network does not accurately simulate the low-frequency line, either of two types of singing may occur. In the circuit arrangement if the same frequency is used for transmission in both directions, the type of singing most likely to occur would be local singing at either terminal. This occurs for the reason that in general the amount of energy applied to the two terminals *c* and *d* is largely amplified in the course of passing through the circuit —modulator, filter 1, filter 2, demodulator and amplifier. If the unbalance in the bridge circuit is such that the fraction of this energy which is fed back to the points *c* and *d* is as large as that originally supplied, singing occurs. To avoid this type of singing different carrier frequencies may be chosen for transmission in two directions. If this is done, local singing cannot be set up, for the reason that filter 2 acts as a block to the return of the output current on itself. End to end singing as distinguished from local singing may, however, occur provided the over-all transmission loss of the line and the terminal apparatus is made less than zero, and provided that there is sufficient unbalance between the artificial lines and the low-frequency lines at both ends. By "transmission loss of less than zero" is meant that the attenuation of the carrier line is more than compensated for by amplification introduced either at the terminal stations or at intermediate repeater stations. However, the accuracy of line balance necessary to prevent end to end singing with carrier circuits such as we have used is very much less than would be required to prevent local singing if the same frequency were used for transmission in both directions. It is interesting to note that in both of these types of singing the sustained oscillations in different portions of the circuit are of different frequencies. Those in the portions used for transmission at voice frequency have some value lying in the voice frequency range. Those in the portions used for transmission at carrier frequencies differ from the carrier frequency associated with that particular channel by the frequency of the oscillations in the low frequency circuit.

Whereas, with the circuit, local singing is prevented by the use of different carrier frequencies in the two directions, it is possible to prevent this type of singing without resorting to different frequencies, with the attendant reduction in number of channels. In this arrangement the energy from the output of the modulator is prevented from reaching the input of its associated demodulator by placing the two in conjugate relation in an alternating-current bridge-circuit, of which the carrier frequency line forms one arm, and a balancing network, designed to simulate the line impedance, the other arm.

Both the arrangements have been successfully employed for two-way carrier current transmission.

Carrier Suppression. One of the systems which has been developed, particularly for use on long high-grade circuits, involves certain fundamental principles in addition to those already discussed. It will be recalled, that as stated, the proper operation of the demodulator requires that the side-band currents, by which are transmitted the characteristics of the speech, be accompanied by a relatively large amount of unmodulated current of carrier frequency. When this carrier current is transmitted from the modulator, it is evident that only a relatively small part of the line current is actually used in conveying the characteristic variations of the voice current. If, therefore, this carrier current is supplied to the demodulator from a local source instead of over the line from the sending station, the amount of line current which it is necessary to transmit per channel is very materially reduced, for

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then only the relatively small side bands are transmitted. In the application of this method, means must be provided for eliminating the carrier current at the sending end and for supplying it to the demodulator from a local source at the receiving end.

Elimination of the carrier frequency at the sending end can be accomplished by what is known as a "balanced modulator," a schematic circuit. In this arrangement two tubes are connected in a manner somewhat similar to the "push-pull" repeater circuit which is described later. The carrier potential is applied through the transformer to the common portion of the input circuit in such a manner that the carrier frequency potentials of the two grids with respect to the filament are at any instant the same. The resultant carrier frequency currents in the plate circuits of the two tubes are then equal, and the fluxes which they set up in the core of the differential transformer are equal and opposite; hence no voltage of the frequency of the unmodulated carrier is induced in the output circuit. By a more detailed analysis it can be shown that the side-band currents resulting from the interaction of the carrier and speech-frequency currents are not balanced out but are reproduced in the output circuit. It should be noted that under these conditions, high-frequency current appears in the output circuit only when low-frequency telephone currents are being applied to the input circuit of the modulator.

(*To be continued*)

Wireless Wheatstone Trials

That high-speed wireless working has made and continues to make great strides, is an accepted fact, and anyone who may have had doubts regarding the utility of Wheatstone for such transmission of telegrams would have been rudely awakened could he have been present at either Cologne or Aldershot Military Wireless Stations recently. In order to test the accuracy of Wireless Wheatstone working, it was arranged for Wheatstone staffs from the Central Telegraph Office, London, to proceed respectively to Cologne and to Aldershot and to work between those places with telegrams prepared in advance.

To enable the number and percentage of fundamental, as distinct from, operating, errors, to be ascertained, it was arranged that the operators at both ends should transcribe the signals as received, and obtain the necessary corrections, showing both upon the relative message forms. By this method it was sought to show the total number of errors, and thus to gauge the practicability of the system in actual working. Copies of the telegrams sent from Aldershot were conveyed to Cologne and vice versa.

The Military Wireless Station at Cologne is situated at Riehl, some three miles distant from the Rhine Army, by which it has connection by wire. Wheatstone apparatus is installed there, and signals were relayed thither from the Wireless Station at Riehl, a special Trigger valve being employed. At the Wireless Station a 1¼ kilowatt Valve Transmitter is used, and signals on a 1,600 metres wavelength were received and transmitted. The trials took place over a period of three days, in the morning and afternoon on two of these, and in the late evening hours on the remaining day, atmospherics being known to be more prevalent during evening and night working. Fifteen-minute periods of transmission and reception were arranged for, with fifteen-minute intervals, to allow of necessary repetitions being obtained. Some difficulty was at first experienced, but conditions improved vastly later, when perfect signals at 100 words per minute were obtained. Indeed, so successful was the working at this rate of speed that trials at 150 words per minute were made with complete success, and a succession of messages were received at Aldershot without a single repetition being required.

It speaks volumes when it is stated that of the 575 telegrams transmitted to, and 478 received from, Aldershot, a total of 1,053, only seven per cent. did not altogether correspond with the typed copies of the original telegrams, the remaining 93 per cent. being correctly received. Of the 150 messages requiring correction, 9 per cent. of the errors were attributed to atmospherics, 6.5 per cent. to operating errors, and the remainder to valve troubles, apparatus faults, etc. So perfect were the signals that had Creed apparatus been installed Creed working could have been successfully achieved.

A facsimile of the Morse signals as received at 150 words per minute.

The trials demonstrated the possibilities of Wireless Wheatstone working between London and Cologne, and the utility of such as an auxiliary to the existing Cable and land-line service in times of pressure and interruption. Wireless Wheatstone would also have the added advantage that without the installation of Wheatstone apparatus it would not be possible to "listen-in," as is the case with key working.—A. W. Edwards, in the *Telegraph and Telephone Journal,* London.

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The History of Vessel Reporting at Sandy Hook

By Wm. de la Motte, Red Bank, N. J.

Years ago, before the electric telegraph was invented, vessels entering the New York Harbor were reported by the pilot boats, and other craft, on which were representatives of the agents of the expected sailing vessels, who had gone outside Sandy Hook to offer their services to the captains, take orders for fresh meats and other provisions, and get the first news of the voyage.

They would then hurry back to New York, landing in their small boats, sometimes on Fire Island, Long Island, New Jersey or Staten Island, where, obtaining some conveyance, they made haste to report the arrival to the owners. They were well rewarded, as an early report would often save much money for reinsurance in case a vessel had a long passage, and nothing had been heard from her since she left the foreign port.

Later came the semaphore. There was a station on the Highlands operated by a Mr. Havens, for many years. Shipping was not so extended as now and he, therefore, only reported the larger "deep-sea" vessels to a station on Staten Island called the Bluff, just south of Fort Wadsworth. From there it was relayed, also by semaphore, to a station on the roof of the old Custom House in Wall Street, New York. There were no skyscrapers in lower New York then, and the signals could be read through telescopes, providing the weather was clear enough.

Then came the telegraph, reaching the Highlands, and the observer, or observers, beat Mr. Havens badly. He, however, soon learned to work the key and was one of the oldest marine observers at his death. Mr. Havens was an old man and used to wear a stove-pipe hat. His son, V. Havens, who had learned the marine business, succeeded him and is living in retirement at the Highlands.

In 1853 the telegraph was extended from the Highlands to Sandy Hook, which is a government reservation, and permission was given to erect an office there.

James Farrell, who had been a New York harbor boatman, moved to Sandy Hook, bringing along his "White Hall" boat, and, when a foreign mail steamer was sighted from the Highlands, he would go out and waylay it off the bar.

On board the steamer the lookout was watching for Mr. Farrell, and when the steamer came near to him they would throw into the sea a water-tight tin can containing several manifold copies of European news and market reports, all written in code, and then proceed toward New York.

Mr. Farrell had with him in his boat a number of carrier pigeons. After picking up the can he would attach one of these reports to a pigeon and give the bird liberty; then he would watch both the bird and the telegraph office on the beach of Sandy Hook. The telegraph operator there had his glass on the pigeon, and as soon as it entered the coop he would secure the reports and hoist a signal for Mr. Farrell which meant "O. K." Mr. Farrell would then try to get back to the beach, and, as the weather had often changed, he sometimes landed on Staten Island or Rockaway. He generally liberated a young pigeon together with the older one for the purpose of training.

If it took too long a time before the signals from the office were given, he would send a second, or even a third pigeon with one of the reports. The first and second might have got lost or did not go into the coop.

Like Mr. Havens, Mr. Farrell also learned to work a key, and when the Atlantic cable was successfully laid the carrier pigeons were retired.

Meanwhile, however, the first Atlantic 1857 cable had failed, and Mr. Farrell was sent to Cape Race, Newfoundland, to intercept steamers coming and going, obtaining their reports and putting telegrams on board and accepting telegrams for transmission. He was there quite a while when he was recalled to Sandy Hook.

His business from Cape Race was sent to Boston and New York. The wires were few, however, and from Cape Race, as well as from Sandy Hook, communication was often interrupted by storms, sleet and other causes. Among other causes I once reported that No. 9 South had been broken by a load of swallows, which was true. In the spring, on their way north, thousands of swallows would stop at Sandy Hook for rest and food, and those that could not find room on the wires would assemble on the sand. No. 9 was an old iron wire and it was hard to work. What held it together at the breaking place I do not know, as it seemed all to be rust. That settled No. 9, and it was taken down.

Mr. Farrell became manager of the Sandy Hook, Western Union Telegraph Office and died, so to say, in the harness. He came on duty one evening in November, 1885, feeling all right, but the next morning he called E. McCann, his assistant, saying he felt badly, and an hour afterward he died. A message was sent to New York, and a boat, with an undertaker on board, came after his body on Thanksgiving Day. Two days later he was laid to rest in Calvary Cemetery, Brooklyn.

Another old Marine Observer at the Highlands also died quite suddenly one Sunday. His name was James McDermott, who had formerly been with the *Herald* ship news, collecting news at New York and Quarantine. He was one of the best observers at the entrance to New York harbor. Funeral services were held at the Observatory at the Highlands.

The Western Union Observatory on the Highlands was erected about 1876 or a little later. The tower, which is a steel frame building, came later. At Sandy Hook the company has had to move from one place to another whenever the government wished to use the place on which the building stood. First, it was a one or two story house, but in 1877 a square tower was erected about ninety feet high. Some three or four years later it had to be moved about a hundred feet, the Atlantic having cut away the sand. Later, in 1900, a new square

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building, two stories, with an octagon superstructure, was erected about one hundred feet high. It was one hundred and five steps from the ground to the office floor.

Alongside of this tower was a flagpole, the mainmast being ninety feet long, with a topmast thirty-six feet long. This flagpole is used for signalling to vessels, flags being hoisted from the balcony which runs around the building at the office floor. The international code flags and code book are used for that purpose, and it is strenuous work in high winds to hoist the flags.

Many a ship's captain has seen the ship's code letters go up, and the next signal would say, "Stop, heave to, or come nearer, I have something to communicate." I would then signal "Proceed to New York." He might say, "Thank you." If, however, my signal would say "Proceed to Baltimore, or Philadelphia, or some other port," he generally would omit the "Thank you," and simply hoist an answering pennant meaning "O. K." unless he could find some excuse to go up to New York, where he could take in the "White Way."

This tower, a few years ago, was moved quite a distance westward on a ground of sand which had washed in there, but where, when first I came to the Hook, vessels had been sailing. It was, however, a relief to move away from the dangerous proximity of the proving grounds, where pieces, large and small, of exploded guns and shells often would fall all around it. William Murray, manager of the Postal Telegraph-Cable Company, was seriously wounded by one of these pieces some twenty years ago. The Postal tower has also been moved a couple of times.

Among the Marine Observers there is strong rivalry as to who can make out a vessel first and get his reports to the different headquarters for their distribution. A keen eye and a good memory are essential for anyone to engage in this branch of the service.

Visitors to the Hook often take a walk up the stairs to have a look at the surroundings, ocean, bay and land, which latter, forty years and more ago, was quite a wilderness. They often asked, "How can you live at such a lonesome place?" and I have told them that it was not lonesome; just like a moving picture show, but with real living pictures.

While on duty, one instrument or another would be ticking, and when something startling happened in the world the press offices would always give me the news first, and I had it before it was printed in the papers; for example, Garfield's shooting, Grant's death, McKinley's shooting, Maine's blow-up, Alexandria bombarded by English, Russian Emperor killed, and many other items, not to forget the baseball scores.

The office has different connections, with the Life Saving (now called Coast Guard) Stations; Ordnance Office Headquarters, Fort Hancock; Officers' Quarters, Soldiers' Barracks, etc., and their frequent calls, "What is the score?" soured me on the national game, as it called me away from my duty.

Sandy Hook duty was, and is, the reporting of all incoming and outgoing vessels, any grounding, stranding, or wrecking of vessels, in fact, anything that can be seen and is of interest to the company's subscribers, as well as trying to get relief and assistance to vessels in distress.

While there was no regular messenger service, I instituted a substitute, before the telephone came into use, by flags or a large fish horn. The different sounds would notify the party or office that a message had arrived and to come and receive it. This was mostly discontinued when the telephone came into use, as we sent and received their messages by that instrument. I believe we were one of the first offices to be equipped.

When the Postal Telegraph-Cable Company started its opposition service in the marine business, I think in 1897 or 1898, they hired some good men away from the Western Union Telegraph Company, but some declined to go. Those who left were soon replaced by others who, after a little while, filled the places satisfactorily, although quite a number who, after a few months, showed they would not be of use, were let down easy.

The Federal Shanghai Radio Station

The Shanghai, China, station of the Federal Telegraph Company, with headquarters at San Francisco, will have the same kilowatt capacity as that of Bordeaux, France, but it will have six masts, each a thousand feet high, as compared with the 826-foot masts at Bordeaux. It will be able to communicate across the Pacific without messages being relayed.

Other stations will be erected by the company under the agreement at Peking, Harbin and Canton, which, together with the Shanghai station, will give China unequalled wireless facilities.

Great Britain, Japan and Denmark attempted to persuade China to repudiate the contract with the Federal Telegraph Company.

Concerts by Radio Telephony

Regular semi-weekly wireless telephone concerts for Allied troops on the Rhine were started on April 3rd from The Hague, Holland, under the direction of a well-known London composer. The audience will listen to the concert by means of a device resembling the electrophone. (An electrophone is an instrument for producing resonant sounds by electric currents; a form of telephonic transmitter.)

The sending apparatus has a radius of 500 miles and the promoters believe many passengers on ships fitted with receiving apparatus will enjoy the concerts each Sunday and Thursday.

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An Appreciation of Thomas Ahearn of Ottawa, Ontario

The regular meeting of the Board of Directors of the Bell Telephone Company of Canada are held monthly at the head office of the company at Montreal. In courtesy to the Ottawa member of the board, T. Ahearn, a meeting was held sometime ago at the Dominion Capital. Afterwards the members of the board, with J. E. Macpherson, district superintendent, were the guests of Mr. Ahearn at the Country Club, at which luncheon L. B. McFarlane, president of the Bell Telephone Company, spoke as follows:

"With the permission of our host, I wish to say a few words about his personality, which should be more widely known.

"Some fifty years ago a little boy attended school on the Chaudiere Flats. He had neither rich nor influential friends, but was endowed with a clever brain and skillful hands, which are far more to be desired. Like all children of that period, the head lines on his copy book contained many precepts, not only to be copied, but instilled in the memory for future guidance. His book, no doubt, carried the oft-quoted phrase—'Great oaks from little acorns grow.' It kept before him this agricultural idea by which he was to do great deeds later.

"In time he took up electricity as a livelihood, and first 'planted' the telephone 'acorn' in Ottawa. Today you see the result in the 'sturdy young oak' in the exchange we have visited.

"Still with the agricultural viewpoint in mind, you find him planting 'bulbs'—Western Electric light bulbs—on the telephone poles on Sparks Street. From this small beginning has sprung the marvelous network of light and power—not only here but elsewhere, because our host, having the vision and the courage, conquered the difficulties of hydro-electric operation. Mr. Ahearn's work in this direction made the hydro-electric method possible and profitable, and it was the pioneer of hydro systems throughout Canada.

"Having in this way conquered all difficulties, we find him still in the agricultural field 'planting' the poles on lines which later became the North American Telegraph System.

"About this time a new electrical wonder appeared at Richmond, Va., in the shape of an electric railway, which was possible in a land without frost or snow. No one thought that such an enterprise could succeed in this northern climate, but we find our host appearing before the Ottawa City Council with his little storage battery plant (you will notice he is still 'planting') under his arm, ready to undertake what practically all people thought an impossibility. Having secured the franchise for a street railway service, it was not possible to find charter members enough to apply for a charter, showing what little confidence the public had in the enterprise, and names to qualify had to be borrowed. The question of what would happen when snow fell in winter time was uppermost, but this obstruction was again successfully solved by Mr. Ahearn. At the same time it settled the question for all parts of America north of New York, and made the street railway the successful public servant it now is.

"Here is a pioneer, who, unlike others who have made their mark in one branch only, has excelled in five of the main branches of electricity, namely, telegraphy, telephony, light, power and traction. It is given to few men to have such a record, and his neighbors have not realized it. His great achievements have not brought him titles or honors, and his native city has not recognized what wonderful benefits he has conferred upon it, but he takes greater delight in being known as 'our Tom Ahearn' than in any title or honor, and he can have no greater monument when his time comes to leave us than the wonderful works he has created in our midst."

THOMAS AHEARN

Mr. Ahearn is president of the Ottawa Electric Railway Company; president, Ottawa Traction Company; president, Ottawa Car Manufacturing Company; president, Ottawa Electric Company; president, Ottawa Gas Company; president, Ottawa Light, Heat and Power Company; president, Ottawa Investment Company; president, Ottawa Land Association; president, The Capital Mica Company, Ltd.; director, Canadian Westinghouse Company; director, Bell Telephone Company of Canada; vice-president, The Wallace Realty Company, Ltd.; director, The Ottawa Building Company; director, The Merchants Bank of Canada; director, The Northern Electric Company; director, The Bankers' Trust Company; member of The American Institute of Electrical Engineers; member, Old Time Telegraphers' and Historical Association; member, Telephone Pioneers of America.

Thomas Ahearn achieved his successes by hard work and co-operation, and naturally he is looked upon with pride and respect by the people of Ottawa. Mr. Ahearn learned telegraphy in Ottawa, where he was born June 24, 1855, and soon devel-

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oped into a first-class operator. In 1873 he was an operator in the main office in New York, where he won for himself a reputation as one of the best telegraphers in the office. A year later he returned to Ottawa and became manager of the Dominion Telegraph Company. His partner, W. Y. Soper, was at the time manager of the Montreal Telegraph Company, and this is how they met. They became interested in the telephone business, forming a partnership in 1882. Mr. Soper was the business manager and Mr. Ahearn the practical man. At first they confined their efforts to small contracts, but later on they managed great undertakings, and the firm prospered from the very start.

These two partners sit opposite one another at a great desk in their office in Ottawa, a telegraph line connects them with all the other offices outside their building in which they are interested. One is a sort of Beau Brummel; the other is a neatly dressed, jolly sort of a man, with a comfortable manner and a big heart shining quietly behind his eyes.

Thomas Ahearn is one of the big men of Canada because he is one of the men who had faith in his town and the nation. He loves to play a practical joke on someone; he loves to remember kindnesses with other kindnesses; he loves New York and visits that city frequently, and above all, he loves the telegraph key.

Mr. Ahearn is an extensive traveler, and has made two trips around the world.

According to the Code

By Edwin Tarrisse, Washington, D. C.

Ciphers and codes are dangerous toys for the amateur. Some time ago a certain Mr. Rice, whose summer house was near a transatlantic cable station, invented a private code, one copy of which he kept himself, and his wife took the other to England, whither she was going for the summer. They thought that if occasion arose communications could be easy and private. Fate willed otherwise. About eight o'clock one evening a messenger brought a cablegram to Mr. Rice's door. It was the day for his wife's ship to arrive on the other side. He opened the envelope and read the yellow slip inside. "Potatoes fish," was all it said.

Turning to his key, he discovered that "potatoes" meant, "I have arrived safely after a good trip. All is well." But "fish" signified "seriously ill. Come by next steamer."

Perplexed, he reread the message, and verified the translation. The same conflicting statements resulted. What should he do? In desperation he cabled back, "Repeat."

After an hour of waiting, the boy again rang the bell and presented an envelope. The message ran this time, "Ships fish."

Translating this cryptogram, he found that "ship" was the cipher for "Everything all right; will be in London two weeks." Fish still had its original sinister significance.

This was as bad as the first. Fearing that such a contradiction meant sickness and inability to use the code correctly, he despatched another message, the single word, "What?" forgetting that in the code "what" stood for "I am better; do not worry."

It was now eleven o'clock. He waited in nervous expectation till midnight, and then turned in and tried to sleep. No sooner had he dropped off than another message arrived, as puzzling and as contradictory as the first. Moved to desperate means, he got up, dressed, went to the office, and wrote out this communication:

"Dear Alice: When you get this message, take a spade, hire a car, and ride out to an open field. Then dig a hole and bury the code.

"Your affectionate husband, John."

"Send that," he said to the bewildered operator.

"But it will cost——" began the man.

"Never mind what it costs," he said, firmly. "I'll pay for it."

Be an Authority on the Telegraph

"Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, offers the most complete study of the telegraph ever published. This standard text-book has been revised and brought up to date, and in addition to numerous diagrams and complete information covering the study of the telegraph, includes full descriptions of the newest apparatus adopted by the Western Union and Postal Telegraph companies, and the equipment of a modern telegraph office. This valuable book, with its 488 pages, 250 illustrations, and carrying an appendix of 24 pages and 16 illustrations covering the new Western Union Multiplex System, is the most sought after electrical book on the market. $2.50 per copy. Address and make remittances to Telegraph and Telephone Age, 253 Broadway, New York.

The Baudot Printing Telegraph System

The issue of a second edition of the "Baudot Printing Telegraph System," by H. W. Pendry, is fully justified by the extension of the use of that system in the United States and in Europe, the improvements made in the apparatus, and the general adoption of the first edition as a class manual.

The descriptions and diagrams of somewhat intricate instruments and connections are so clear that it is possible to obtain a good knowledge of the system from the book alone, without the necessity of seeing and using the instruments before the information in the book can be said to have been usefully assimilated.

Of the new matter introduced, the most notable is that treating of the Murray phonic motor and the Gulstad Relay. The chapters on Duplex Baudot and Baudot repeaters has been enlarged. The number of illustrations and diagrams has been increased from 72 to 94. The price of the book is $2.50 per copy, and orders should be addressed to Telegraph and Telephone Age, 253 Broadway, New York.

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Circuit Details of the Connector Switch

By Harry E. Hershey of the Automatic Electric Company, Chicago.

In the preceding chapter mention was made of the private bank. This bank (see Fig. 8) consists of one hundred single contacts, ten contacts in each level and ten levels high. The object of the private bank is to supply means by which a line may be protected against intrusion, when that particular telephone is in use. We have found that each telephone is connected to a certain pair of contacts in the line bank, the corresponding contact in the private bank is also associated with this line. For our present purpose it is sufficient to remember that whenever a telephone is in use the corresponding private bank contact is grounded.

Testing the Called Line for Busy

Referring to Fig. 9 we find the familiar series relay S and the rotary magnet R.M. A slow acting relay A is shown in parallel with the rotary magnet. The resistance of this relay is 335 ohms and, as it is a slow acting relay, it remains in an operated position during the time that impulses are passing to the rotary magnet. The busy relay B may be of 1300 ohms resistance. The wiper cut-off

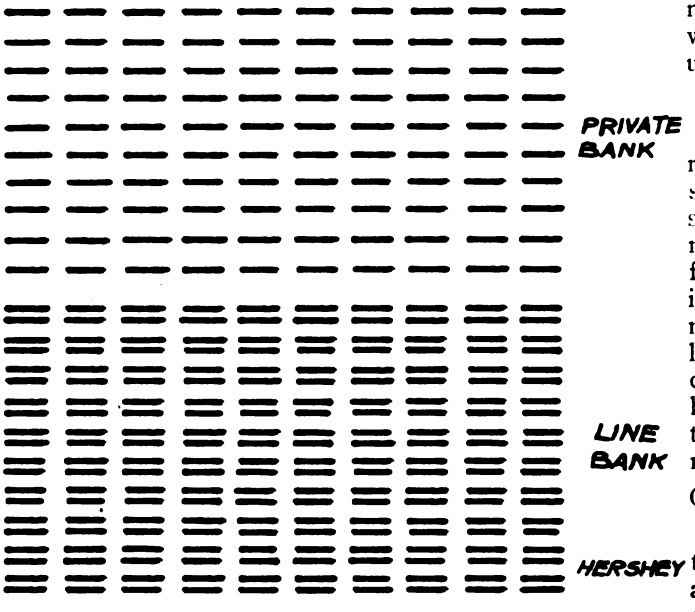

Fig. 8. Line and Private Banks.

relay W does not concern us at this time, beyond the fact that it operates after the completion of the rotary movement, should the called line be idle. The spring assembly on relays A and W illustrate what is called "make before break" springs. When the relay energizes the make spring strikes the movable spring and causes it to break contact with the stationary spring.

In the preceding chapter the wipers of the connector were advanced to the contacts associated with telephone number 65. We will now assume that this telephone is in use, and that its private bank contact is grounded. The relay A, being slow acting, will remain energized for an instant after the cessation of the rotary movement. At this time a circuit may be traced from ground at the private bank contact, through the private wiper, break springs relay W, make springs relay A, through busy relay B to negative battery. The current flowing in this circuit will cause relay B to energize, upon doing so it will form a locking circuit for itself independent of the ground from the private bank contact. This circuit may be traced from "off normal spring ground" make springs relay B, break springs relay A (which by this time has de-energized), through relay B to negative battery. In addition, relay B closes a pair of contacts which place the busy tone on the positive line, as an indication to the calling subscriber that the called line is busy.

Locking on Busy

When relay B is once energized it is independent of the ground on the private bank contact; therefore the calling subscriber will continue to receive the busy tone even though the called line should become idle. When a busy line is called the wiper cut-off relay W does not operate to cut the connector through to the wipers, and as a result there will be no interference with the parties already using the line.

Prevention of Further Rotation

It will also be noticed that the circuit to the rotary magnet is taken through a pair of break springs on relay B. If it were not for this provision a subscriber, while receiving the busy tone, might again operate his dial, which would cause a further rotation of the connector and would result in a wrong number. Relay A carries a pair of make springs which short the break springs of relay B. Should the private wiper pass over several consecutive busy contacts in the level, the relay B has a tendency to operate, and if it were not for the above provision the circuit to the rotary magnets might be opened.

Guarding the Called Line Against Intrusion

Let us now assume that the called line is idle, therefore there will be no guarding ground on the associated private bank contact. After the de-energization of relay A, a circuit (which will be explained in the next chapter) is closed through the wiper cut-off relay W, this relay then energizes and places ground upon the private bank contact. As a result anyone calling this number will receive the busy tone, and thus the called line is guarded against intrusion.

Questions

A. What would result if the lower make springs on relay B failed to make?

B. If you called a line which was busy and did not get the busy tone where would you look for the trouble?

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C. If the private wiper failed to make contact with the private bank, would you cut in on a busy line?

D. If you made a call and got both the called subscriber and the busy tone, where would the trouble probably be?

Removal of the Line Wipers During Rotation

When the line wipers of the connector are stepped up and in to reach the bank contacts associated with line number 65, it is quite evident that they will momentarily make contact with lines 61, 62, 63 and 64, as they rotate over the contacts in the sixth level. It is, therefore, essential that these wipers be disconnected from the connector while the rotary movement is taking place, otherwise the parties using line 62, for instance, would experience an unpleasant sound as the wipers passed over contact 62.

Referring to Fig. 10 will be found the familiar slow acting relay A, and the wiper cut-off relay W, which carries two windings, one of which is 1300 ohms in resistance and the other 125 ohms. It will be noted that when relay W is at normal the line wipers are disconnected from the remainder of the circuit. When a line is not in use its associated private bank contact is connected through a resistance of some 1200 ohms to negative battery. In the figure this resistance is designated by the letters B.C.O.; a further explanation of this feature will be given in a future chapter.

Let us assume that the number 65 has been called and that the line and private wipers are now resting upon the bank contacts associated with telephone number 65. When relay A de-energizes, following the last rotary impulse, a circuit may be traced from "off normal spring ground," low winding relay W, break springs relay A, break springs relay W, private wiper, private bank contact, through the B. C. O. to negative battery. The lower winding of relay W will energize sufficiently to close the springs X, thus forming a locking circuit which may be traced from "off normal spring ground," springs X, through the high winding of relay W to negative battery. The current flowing in this circuit will cause relay W to become fully operated. As a result the line wipers are cut through to the connector and ground is placed on the private wiper.

Instantaneous Ring Cut-Off Circuit

In the previous chapter we discussed the testing of the called line to determine whether or not it was busy. We will now consider the means by which the connector switch is enabled to automatically ring the called subscriber.

With reference to Fig. 10 the generator G may be considered as representing any source of alternating current which can be utilized to operate the ordinary telephone ringer. At R.I. is shown a ring interrupter, which for the present may be considered merely as a constantly moving spring which is continually making and breaking its two contacts. The instantaneous ring cut-ox relay C is a double wound slow acting relay. The construction of this relay differs from that of the ordinary slow acting relay in that the copper slug is much thinner and extends the full length of the core under the windings. Relay C carries two windings, the first a low resistance winding of 200 ohms, and the second a holding winding of 1300 ohms.

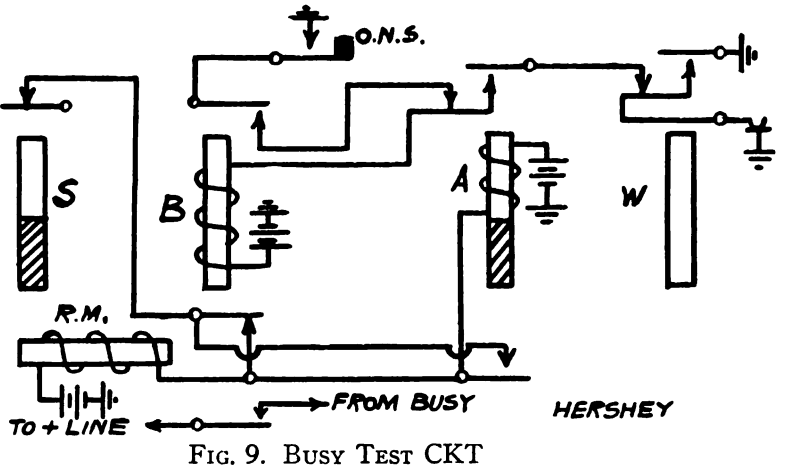

Fig. 9. Busy Test CKT

An interesting feature of a slow acting coil is that it refuses to respond to alternating current. If alternating current is passed through the low winding of relay C the armature will remain at normal, precisely as though no current were passing through the relay.

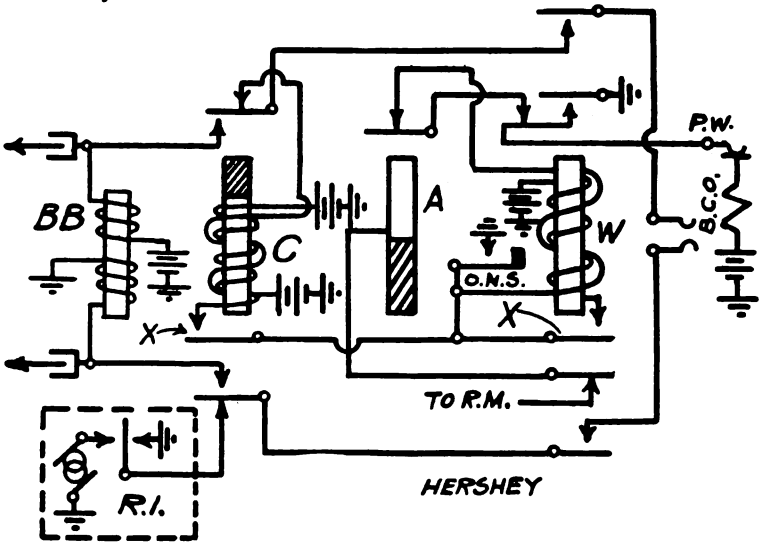

Fig. 10. Removal of Line Wipers During Rotation

Let us assume that the wipers of this connector switch have been brought to rest upon the contacts of an idle line and that the relay W has operated to cut the connector through to the line wipers. A circuit may now be traced from ground through the generator G, ring interrupter, break springs relay C, make springs relay W, lower contact of switch hook, ringer and condenser (not shown), make

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springs relay W, break springs relay C, and low winding relay C to negative battery and ground. The condenser will prohibit the flow of battery current in this circuit, but the alternating current will flow and operate the ringer at the called sub-station. The alternating current passing through the low winding of relay C does not cause it to energize, as has been previously explained. The bell will continue to ring intermittently as the ring interrupter operates back and forth.

Let us consider that the subscriber removes his receiver during the time that the generator is in the circuit. As soon as the transmitter and receiver are bridged across the line there will be a flow of direct current over the above traced circuit in addition to the alternating current already flowing. This flow of direct current will cause relay C to attract its armature. The springs of relay C are so arranged that springs X make contact before the other springs are operated. As soon as the springs X engage a circuit is closed through the holding winding of relay C, which causes the complete energization of this relay. As a result generator is removed from one side of the line and the low resistance winding of relay C from the other, and at the same time the line is connected through to the back bridge relay BB.

If the subscriber had answered during a silent period the relay C would have operated as before. This time, however, there would have been no alternating current superimposed upon the direct.

QUESTIONS

A. What explanation could you give of the following subscriber's complaint: "The bell rings and when I answer there is no one there"?

B. What would result if the ringing interrupter lead became permanently grounded?

(To be continued)

Pension Bill For the Relief of United States Military Telegraphers

The bill providing pensions for telegraphers who served during the Civil War, which failed of passage during the previous Congress, has been reintroduced by Representative McKenzie of Illinois. It is known as H. R. 5815, and it is expected it will now be acted promptly upon by the present Congress.

A Bill.—Granting relief to persons who served in the Military Telegraph Corps of the Army during the Civil War.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in the administration of the pension laws governing the National Home for Disabled Volunteer Soldiers, or any branch thereof, any person who served ninety days or more as a military telegraph operator during the Civil War and who has received, or is entitled to receive, a certificate of honorable service in the Military Telegraph Corps of the Army of the United States as provided for in an Act entitled "An Act for the relief of telegraph operators who served in the War of the Rebellion," shall be held and considered to have been mustered into the military service of the United States at the date of employment in said Military Telegraph Corps and to have been honorably discharged therefrom at the date said employment ceased: Provided, That no pension shall accrue prior to the passage of this Act.

Those desiring information regarding the pending legislation can obtain the same from the secretary of the Society of the United States Military Telegraph Corps, David Homer Bates, 658 Broadway, New York.

Annual Meeting of the Associated Press

The annual meeting of the Associated Press took place in New York on April 26th. The Board of Directors re-elected F. B. Noyes, of the Washington *Star*, as president; Melville E. Stone, counselor and secretary; Frederick Roy Martin, general manager and assistant secretary.

The report of the Board of Directors showed that during the year 1920 the mileage of leased wires was augmented 4,600 miles, making the total 69,432. The number of operators increased to 785, and the number of automatic printing machines to nearly 200. Expansion of the news resources at home and abroad were touched upon.

After serving as general manager of the Associated Press since its organization twenty-eight years ago, Melville E. Stone relinquished his office and Frederick Roy Martin was chosen to take his place. Mr. Martin was appointed assistant general manager in 1912, and during the illness and absence of Mr. Stone has been acting general manager.

Unwilling to release Mr. Stone from his work, the directors insisted that he retain his post as secretary. So that his experience would not be lost to the organization, they created for him a new post of counselor. Mr. Martin holds his place as assistant secretary.

ONE of the most interesting films from an educational point of view is "News by Wireless," made by the Marconi Wireless Company, London, to illustrate how messages are transmitted by wireless telegraphy from Geneva to London so speedily that the speeches delivered in the Parliament of the League of Nations can be read by newspaper buyers in London within an hour of their being spoken. The film which the Marconi Company exhibited privately in their own theatre on April 28th makes the whole process of wireless telegraphy perfectly clear even to a spectator who has but the vaguest notions of this mysterious modern magic. Is there anything a film could not teach in proper hands? The infinite divisibility of matter, and many other problems that puzzled the schoolmen throughout the ages, could certainly be explained on the screen in a manner that would set all doubts at rest for ever.

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Radio Corporation of America

The following officers were elected by directors of the Radio Corporation of America on May 6th: Owen D. Young, chairman of the board; Edward J. Nally, president; John W. Griggs, general counsel; John W. Elwood, secretary; George S. De Sousa, treasurer; David Sarnoff, general manager; Charles J. Ross, comptroller; L. McConnach, assistant secretary, and M. H. Bayne, assistant treasurer.

At a special meeting of the Board of Directors, held April 29th, Mr. David Sarnoff was appointed general manager.

Mr. Sarnoff has been continuously with the company for fifteen years, having climbed from the bottom of the ladder, his last assignment having been that of commercial manager. He is well and favorably known throughout the radio world, having served three terms as secretary of the Institute of Radio Engineers.

A complimentary dinner was tendered Mr. Sarnoff at the Hotel Astor May 5th by the heads of departments, twenty-five being present. Addresses were made by Mr. Nally, president; Mr. De Sousa, treasurer (who acted as toastmaster); Mr. Ross, secretary; Mr. Alexanderson, chief engineer; Dr. Goldsmith, director of research; Mr. Weagant, consulting engineer; Mr. Brown, attorney; Mr. Lemon, director of traffic production; Mr. Porter, general superintendent, Marine Division; Major White, vice-president, Wireless Press, and Mr. Sarnoff responded.

G. E. BAXTER, superintendent, San Francisco, was a recent visitor at the executive offices.

W. A. WINTERBOTTOM, traffic manager, sailed on the steamer *Aquitania* May 5th for a business trip to England and the Continent.

COLONEL C. H. NANCE, accompanied by Mrs. Nance, sailed for Buenos Aires on the steamer *Vasari* May 7th.

MEMBERS of the Radio Provident Club to the number of about one hundred enjoyed a dinner-dance May 3rd in the building of the Telephone Social Club, West 17th Street, New York, the building having been kindly loaned for the occasion. The affair was a great success, the music being by the Telephone Employees' Orchestra. The date being coincident with the birthday of E. B. Pillsbury, general superintendent, he was presented with a birthday cake with sixteen candles. The billiard room and bowling alleys were well patronized.

AN association of officials of the Radio Corporation has been formed to be known as the Static Club, with Dr. A. N. Goldsmith as president, G. S. De Sousa as treasurer and E. B. Pillsbury as secretary. Frequent meetings will be held for social intercourse and mutual improvement along co-operative lines.

IDLENESS is the pathway to mischief.

Dinner of the Dot and Dash Club

The Spring Dinner of the Dot and Dash Club of Philadelphia was held at the Hotel Lorraine, May 5th, President C. E. Bagley acting as toastmaster. The affair was the most brilliant ever held in the history of the club. Interesting addresses were made by Messrs. Frank W. Griffin, E. C. Boileau, Andrew Lang, Andrew Wallace, Benjamin Reilly, Thomas Parker, A. G. Strickland, W. E. Vanarsdale, R. C. Murray, John A. Chapman, all of Philadelphia, and Clarke E. Diehl of Harrisburg, whose stories are always entertaining. When Dennis F. Brown of Washington, D. C., was called upon he outpoured a number of witty sayings. When he was about to leave Washington for Philadelphia he was asked by a prominent member of the telegraph fraternity where he was bound for, to which he replied: "Philadelphia to dinner." His questioner then stated he was going a h—— of a distance for a dinner. "Denny," however, came back, as only a real Irishman can, with: "If you would join me, you would gain ten years of real vigor, as Philadelphians have the secret of perpetual youth."

George D. Carney received the heartfelt sympathy of the diners, because of the accident which befell him as he was about to enter the hotel. A bottle containing "battery juice" broke, necessitating the use of three handkerchiefs. These same handkerchiefs were in great demand by reminiscent hunters.

As has been the custom for many years, Colonel Joseph S. Greene, was remembered with a box of cigars. He acknowledged its receipt through his faithful daughter, signing the note "Colonel." This is remarkable, in view of his age and infirmities.

Letters of regret were read from D. A. Mahoney, who is well known to Philadelphians for his earnest endeavors in all things pertaining to the welfare of the telegrapher; John Irwin, George Maertz, G. W. Smith, Jr., T. J. Merrick, and Secretary of the Old Time Telegraphers' and Historical Association Thomas E. Fleming. Everybody in the town where lies the great Liberty Bell has a warm spot for "Tom." It was the concensus of opinion that he must not allow his absence from Dot and Dash dinners to become a habit.

Following the dinner, President Bagley turned the meeting over to the Entertainment Committee. William D. Hoos, of the Westinghouse Company, ably acting as stage manager, provided an entertainment of all headliners in the Keith Circuit, and the Dot and Dash diners were boys again.

Radio for Greenland

Building of a wireless station in Greenland is again being considered. Europe as well as America is said to be interested in the project. The British authorities have approached the Danish Government in the matter.

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY.

By Louis Casper.

Lesson 27

Before proceeding with the lesson, it may be well to explain a little further the object of these introductory discussions, which are largely based on the theory of alternating currents.

The theory of alternating currents is so closely interwoven with that of multiplex telegraph operation, that it is hardly possible to have a thorough grasp, in principle at least, without having some conception of the former theory.

Practically all text books bearing on alternating current phenomena associate the same with electric light and power machinery, together with the distribution of power currents produced by this apparatus. It is difficult for the student to apply the information thus presented and harmonize it with the theory of telegraph operation, especially if these text books indulge in somewhat difficult mathematical formulas, as most of them do.

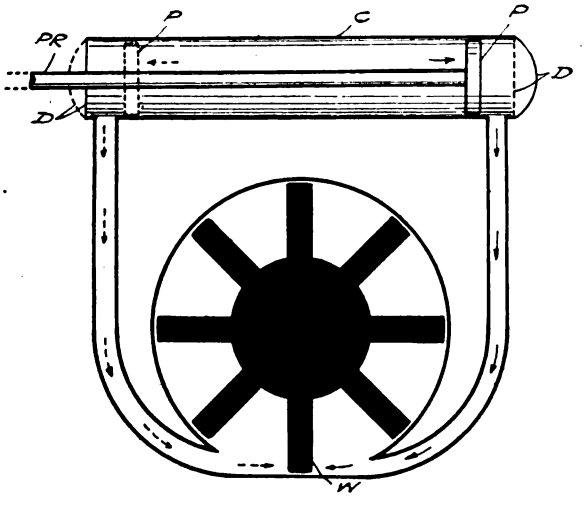

FIG. 69

The presentation of the theory of alternating currents in an elementary way is a matter of some difficulty. It must, therefore, be assumed that the student has acquired a fair understanding of direct current theory and the elementary principles of the duplex. The exemplification of a few simple formulas should not discourage the student. When once mastered, the subject matter at once becomes clear. After a fairly good grasp of the science relating to alternating currents, many things that have been obscure are suddenly illuminated. Some conceptions with regard to the theory of the operation of certain apparatus which the student may be handling are seen with a broader and more comprehensive understanding. This naturally would result in a higher efficiency of work performed; and, best of all, a greater personal satisfaction of knowing why certain things are done.

The knowledge of those who have to deal with the operation and maintenance of the telegraph today is quite advanced over that of the same class

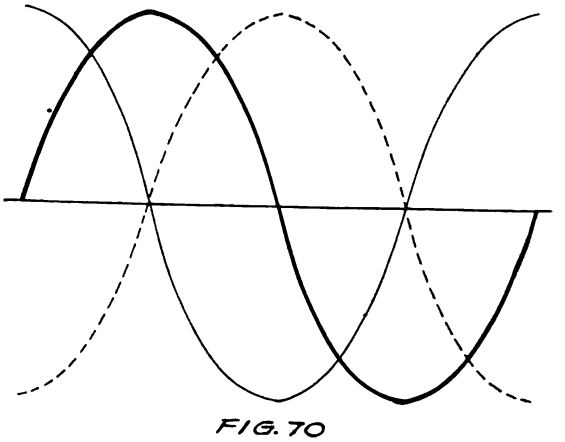

FIG. 70

of individuals ten years ago, and it is safe to assume that the knowledge of such ten years hence will be advanced in the same ratio as the period previous. Therefore, the man that acquires his knowledge now and progressively adds to the sum total of the same, insures his future as against those who are satisfied with simply following out a routine of duties and nothing more.

Induction and Inductance

It was stated in the previous lesson that in every circuit in which the current is alternating in polarity that counter e. m. f.'s are created which tend to cause a "lagging current." This lagging current is largely due to the counter e. m. f. of self-induction or inductance.

The rise of the generated e. m. f. impressed upon the line is obviously accompanied by some current, and this current immediately gives rise to a counter e. m. f., as already stated. This in turn checks the current and keeps its value within smaller limits than in a direct current circuit; for example, that of a single Morse wire.

When an alternating current attains a steady value, the lines of force created by such current become stationary and the inductive e. m. f. disappears. The inductive e. m. f. is thus in a way independent of the actual current strength in the circuit at any time, it being dependent entirely upon the *rate of change* of that current. A very small amount of current increasing or decreasing at a rapid rate would produce a much greater counter e. m. f. than an exceedingly heavy current changing in value at a slow rate.

The effect of inductance, neglecting capacity for the time being, in its action on a circuit may be studied by the use of a mechanical analogy shown in Fig. 69, which represents a cylinder C filled

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with water and inside of which a piston P is moving back and forth impelled by some exterior mechanical force operating on the piston rod PR. Directly underneath the cylinder is a heavy water wheel of considerable inertia. The water acted upon by the piston will move the water wheel in one direction or the other, depending on whether the piston is moving forward or backward. The water wheel offers very strong resistance to the flow at first, but this resistance gradually becomes less until finally when the wheel has attained the full speed of the moving water, the entire force of its inertia has been overcome and all that is now necessary to keep the wheel revolving is just sufficient pressure to overcome the friction of its bearings.

As the speed of the wheel increases it acquires momentum, and its maximum is attained just as the piston is about to return after having finished its stroke, and while the piston is in this position the water wheel opposes the return movement of the piston. When the piston starts to recede, the forward motion of the wheel is arrested and finally stops revolving for an instant, and as the piston continues to recede the wheel slowly reverses its motion and attains its maximum speed when the piston has returned to its starting point. It will thus be seen that the wheel is returning the greater part of the force expended upon it by the piston at a time when the pressure of the latter is at its lowest value, and thus seeks to retard it.

The action of the wheel is analagous to the action of inductance in an electrical circuit. Such an inductance is shown in the form of a diagram in Fig. 70. The heavy curved line indicates current. This current, as explained in Lesson 26, produces a counter effect proportional to the rate of change of the current value as it rises from zero to a maximum, back to zero, and then in an opposite direction to a maximum, then returning to zero again, completing the cycle. The counter e. m. f. is, therefore, using a geometric term, at right angles to the current, and is shown by the dotted line. The e. m. f. (impressed) that causes the current is directly opposite in direction to the counter e. m. f., and is seen by the light continuous line.

The formula governing the inductive reactance of a circuit, coil or device is given by the formula:

$$X_L = 2\pi fL$$

where X_L = the inductive reactance in ohms; $\pi = 3.1416$; f = the cycle frequency and L the inductance in henrys.

The henry is the practical unit of inductance. A circuit is said to have an inductance of one henry when there is an e. m. f. of one volt (over and above the electro-motive force required to overcome electrical resistance) induced in the circuit due to a change in the inducing current of one ampere per second.

The henry is generally too large for practical work and the millihenry is largely used. This is equal to .001 henry. It is obvious that the inductive reactance of a circuit varies as the cycle frequency. For this reason the speed of transmission of an automatic circuit is the governing factor in ascertaining the inductive reactance of the latter.

The next lesson will deal with capacity and the combined effects of both inductance and capacity on a circuit.

CORRECTION

In the previous lesson the Greek letters "theta" θ and "phi" ϕ were shown as capital letters; these designating symbols should be in small letters. The capitals have a different designation.

(To be continued)

All America Cables

IN its report for 1920, issued to the company's stockholders on April 29th, there is shown net revenue from operations and other income, after depreciation and tax charges, of $4,060,695, equal to $18.39 a share on the $22,991,400 capital stock. This compares with $15.90 a share earned in 1919.

THE consolidated statement of All-America Cables and the Mexican Telegraph Company discloses gross revenue from operations of $9,664,900 for the year.

THE company now has more than 23,000 miles of submarine cables and more than 3,000 miles of land wires in operation in North, Central and South America.

JOHN LEONARD MERRILL, president of the company, accompanied by his wife and his secretary, sailed for England on the steamer *Adriatic* on May 4th to attend the launching of the company's new cable steamer *All Americas,* being built at New Castle on Tyne. The *All-Americas* will soon be placed in service and stationed at New York.

WILLIAM A. MCLAREN, vice-president, sailed for France on the steamer *Olympic* on company business.

W. B. STEVENS, manager, Valparaiso, Chile, sailed on the steamer *Lapland* from New York for Europe on a six months' furlough.

THE Marconi Wireless City Office of London is exchanging a large volume of business daily between that city and Paris. The rate of speed is from sixty to eighty words per minute, duplex Wheatstone. The Marconi Company handles a large proportion of the Stock Exchange business between London and Paris. G. E. Clarke, formerly of the Commercial Cable Company, New York and London, has been in charge of the London Marconi office since September, 1914.

The current price of copper is 12½ cents a pound, as against a high level of 37 cents in 1916.

Taking advantage of the slump in prices to lay in a year's supply of copper, the Western Union Telegraph Company has picked up millions of pounds of copper and copper wire. The purchases, made in one, two and three million pound lots, have been at various quotations. The entire lot cost an average of 12 cents a pound.

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EDITORIAL COMMENT

When Edison Speaks He Says Something

Thomas A. Edison, who has practically abandoned his laboratory work temporarily to rehabilitate personally the efficiency of his West Orange plant, has taken charge of the engagement of all employees except factory hands. In an interview a few days ago he described how since last November he has been making intelligence tests of his workers and applicants for employment, and talked about conditions in his industries and various undertakings he is now engaged in.

Long questionnaires prepared by the inventor are used for the tests. After they are filled out by employees or applicants they are examined by Mr. Edison. The types, of which there are several, are usually assigned according to the kind of work asked for, but some are generalized and Mr. Edison judges the possibilities of the signer by the answers. He then puts the worker in the place he considers the most suitable.

"The results of the tests are surprisingly disappointing," Mr. Edison declared. "Men who have gone through college I find to be amazingly ignorant. They don't seem to know anything. Take this questionnaire, for example. This man has gone through college, but I have rated him 'X Y Z,' which is the lowest possible. The connection between that man's senses and his mind has become atrophied. When I discover that anyone fails to come up to the standard I set I give him a week's pay and fire him."

The inventor once before expressed an opinion that college education does not make for efficiency.

Further amplifying his statement that the average college man is "amazingly ignorant," he added, that the fault for this ignorance rests with the primary schools and not with the colleges.

"The trouble is that boys' mind are atrophied before they reach college," said the inventor. "This is due to the primary school system, which is repulsive. There is nothing to attract a boy, who is taught by word instead of by eye. I have never seen a boy who liked to go to school, and I don't suppose I ever will, unless the method of teaching is changed."

Mr. Edison recommended a more general use of the moving picture in the classroom, thus reaching the child's brain through the eye instead of through the ear. He recounted the success of an experiment he made some years ago with a picture which was shown to school children. "That picture carried home to the children the danger of the undertow at Long Branch Beach, as no lecture possibly could," he said.

"Anything can be taught with moving pictures," said Mr. Edison.

About fifteen of the questionnaires are examined daily by the inventor, who, as a rule, looks them over at the close of his day's work. So far he has passed upon about 600, he said.

"You take a man of twenty-two or so and if he is intelligent he can do anything.

"When I engage a worker I keep a watch on him. They usually start low, but if ability is shown the rise is rapid. Most employers don't know the possibilities of their workers, as they fail to keep in touch with them.

"I expect to continue to attend personally to the employment of some of my workers. I will be able to do this, I believe because the return to normal of business will be gradual and it will not be necessary for me to engage a large number at one time."

Mr. Edison, who was seventy-four years old February 11th, appeared to be in good health and good spirit—and optimistic. He works from about 9 A. M. to midnight or later almost daily, and sleeps for six or seven hours each night. The inventor remarked that he would like to do more work, but "my wife won't let me." He denied reports that he had assumed personal direction of the business affairs of the Edison Industries or that there was to be any change of policy in the management of the companies.

"I don't have to worry much about the business," he remarked, smilingly. "There isn't any."

Upon the door of the laboratory Mr. Edison has had placed a sign in large letters:

: A MAN WILL RESORT TO ALMOST :
: ANY EXPEDIENT TO AVOID THE :
: REAL LABOR OF THINKING. :

Appeal For Telephone Relics

The American Telephone and Telegraph Company and the Western Electric Company are soliciting additions to the museum of telephone relics, which is located in New York. These companies will appreciate the gift or the loan of any material of historical value to the telephone industry. Anything in the nature of records, early type switchboards, telephone apparatus, such as jacks, plugs, cords, drops, relays, etc., or photographs of apparatus or telephone exchange installation, and unusual construction, etc., are particularly desired for the museum.

In renewing his subscription for another twelve months, David Homer Bates, formerly president of the Baltimore and Ohio Telegraph Company and secretary of the Society of the United States Military Telegraph Corps, writes: "Check for $2.00 enclosed. Thanks. Never drop me from your list."

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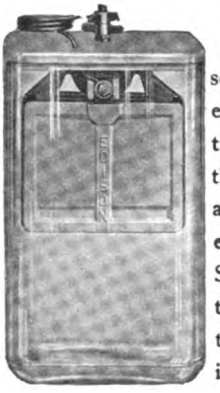
The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.



EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.

1205 Hobart Bldg., San Francisco, Cal.

2044 Railway Exchange Bldg., St. Louis, Missouri.

DIAPHRAGM *Telegraph Sounder*

Economical Operation of the Telegraph

Diaphragm Sounders are extensively used in line offices—and, wherever a dependable and economical service is demanded.

Properly attached, they require no further attention. When the relay works, the sounder works—that's all there is to it.

The Diaphragm Sounder soon pays for itself in the elimination of local battery cost, then continues to give service of high efficiency for many years absolutely free of cost.

You can make good use of Diaphragm Sounders on your lines, both in the interest of economy and efficiency, as they insure a goodly measure of both.

Used by More Than 100 Railroads, Pipe Lines and Oil Companies. Be sure they're on the next requisition.

Write for descriptive folder

RAILWAYS LABOR SAVING DEVICE CO.,
1106 Arlington Ave., DAVENPORT, IOWA

A Money Saver to Railroads

HALL SWITCH & SIGNAL CO.

Garwood, N. J. Chicago

MANUFACTURERS OF THE

GILL SELECTOR

THE UNIVERSAL SELECTOR FOR TELEGRAPH AND TELEPHONE

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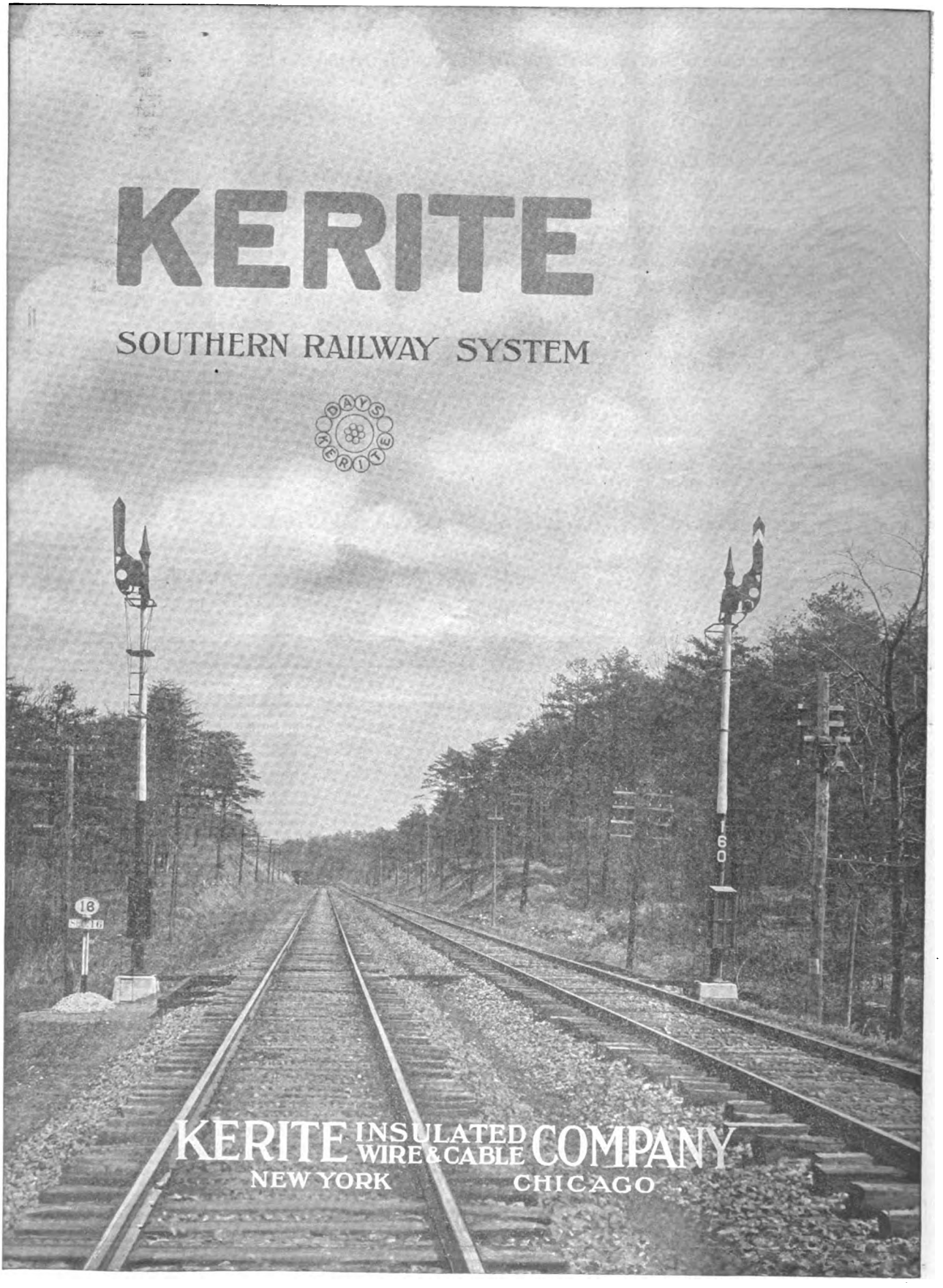

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THE RAILROAD

THE superintendents of telegraph of the railroads are busily engaged with the proposed revision of working rules and service conditions for employees to be presented to the United State Railroad Board on or before July 1st. This revision takes the place of the so-called national agreement rules put into effect during Federal control, which have been cancelled by the Labor Board, effective July 1, 1921.

IT is suggested that in view of the fact that in these days about seventy-five per cent. of the business handled by railroad superintendents of telegraph pertain to the telephone, that the title of superintendent and name of the department should be changed to superintendent telegraph and telephone, and telegraph and telephone department.

THE papers and reports for the September meeting of the Telegraph and Telephone Section of the American Railway Association to be presented at the fall meeting, to be held at the Hotel Cleveland, Cleveland, Ohio, on September 22nd, 23rd and 24th, are practically ready and will be sent to the printer within a short time. Assurance has been received from the executives of the American Railway Association that the meeting in Cleveland will surely be held because of the importance of handling the many problems affecting the economical advancement of the telegraph and telephone, which will be considered by the Telegraph and Telephone Section at its next meeting.

Ampere Club Organized

There has been organized on the Rock Island Railway System an association to be known as the "Ampere Club," having as its object a mutual study of things electrical insofar as they pertain to the telegraph and telephone.

The society consists of thirteen or more local clubs located at the various relay offices. Membership includes managers, wire chiefs, operators, linemen, etc. Each club is a self-governing body, although to some extent under the supervision of the general society and reporting to it.

Lessons assigned by the general society will be taken up simultaneously by the local clubs, and after sufficient time for a study period has been given to individual members, each local club will meet in class recitation of the lesson assigned for that particular period, at which time informal discussion of the lesson will be engaged in as a sort of clearing house method of clearing up ideas which individuals may have formed in their study of the lesson. Reports of meetings and of accomplishments will be made by the local clubs to the committee of direction of the general society and to the superintendent of telegraph. Occasional examinations of individual members will be held as a means of determining progress.

The telegraph employees of the Rock Island are enthusiastic in their reception of this idea, and are devoting a great deal of their time to an effort toward its success, while the telegraph officials are warmly sponsoring the movement.

For a beginning it has been decided to use the Student's Course now running in the TELEGRAPH AND TELEPHONE AGE as a text book.

The officials who are responsible for the formation of this association are G. D. Hood, superintendent of telegraph, and A. W. Douglas, assistant superintendent of telegraph, together with representatives at Cedar Rapids, Chicago, Davenport, Des Moines, El Reno, Fairbury, Fort Worth, Goodland, Kansas City, Little Rock, Topeka, and Trenton.

President to Be Given Control of Cable Landings

The United States Senate on April 26th, after a brief discussion, passed the bill of Senator Kellogg, of Minnesota, to prevent unauthorized cable landings in the United States. The Senate action followed protracted hearings before a sub-committee of the Senate Interstate Commerce Committee, in which the story of the controversy between the Western Union Telegraph Company and the State Department over the attempted landing of a cable at Miami was fully developed.

The bill, as passed, gives the President sweeping authority to prevent cable landings in the United States or any of its possessions, to issue licenses to land or to revoke such licenses. The President under the bill can also make use of the authority he is given to obtain cable concessions for the United States in other parts of the world. Back of the passage of the bill there is a purpose to secure in Latin-America better cable facilities and to make the United States less dependent on foreign cables.

The bill as passed provides that no person shall land in the United States any submarine cable directly or indirectly connecting the United States with any foreign country or connecting one portion of the United States with any other portion unless a written license has been issued by the President. Any cable now laid within the United States without a license granted by the President may continue to operate ninety days from passage of the act.

Section 2 of the bill provides the President may withhold or revoke such license when satisfied such action will assist in obtaining rights for the landing or operation of cables in foreign countries or in maintaining the rights or interests of the United States or any of its citizens in foreign countries or will promote the security of the United States. The President may grant such license on such terms as will assure just and reasonable rates. The license is not to give the licensee exclusive rights of landing or of operation in the United States.

The bill provides for a penalty, the maximum being a fine of $5,000 and imprisonment for one year. It applies to all the territory subject to the jurisdiction of the United States, including the Philippines and Canal Zone.

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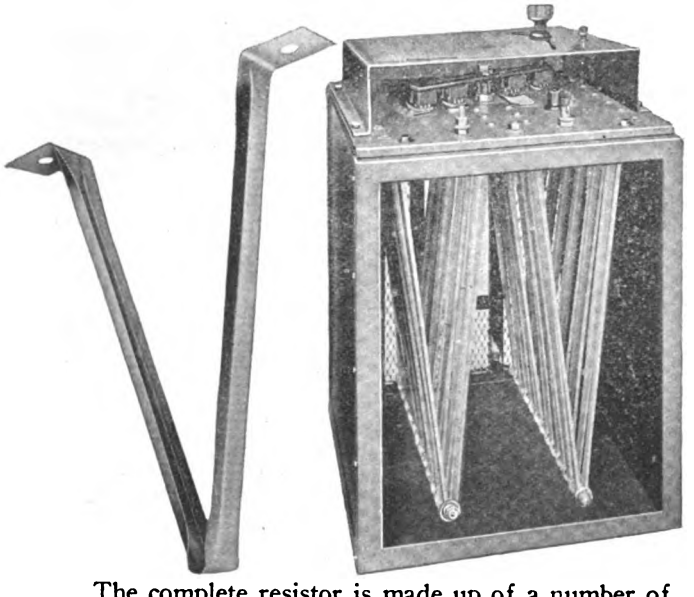
Description of Ribohm

High current capacity rheostats which must dissipate comparatively large amounts of power are usually made with cast iron resistor units, cast in such form as to give a large radiating capacity.

Cast iron has many disadvantages when used as a resistor. For instance, it is heavy, breaks easily, changes its resistance considerably with temperature, and disintegrates when subjected to repeated overheating.

High resistivity alloys in ribbon form compared with cast iron have the advantage of light weight and are not easily broken. However, as ordinarily used, there is some difficulty in supporting ribbon resistors so that they will not sag and short-circuit or burn off at points of contact.

The Ward Leonard Electric Company has recently developed a ribbon resistor unit, which is so designed as to utilize the strength of the material to such a degree that the complete unit is self-supporting. This unit is made by forming metallic ribbon into the trough or channel-shaped section which is flattened at both ends and in the middle. The unit is then bent about the middle to form a "V" as shown in the accompanying illustration, and both ends are turned up to form supporting feet, which permit the attachment of the unit to a suitable panel board.



The complete resistor is made up of a number of such units connected in series or parallel. When connecting in series the units are mounted in zig-zag fashion, being joined at the feet where they are held in close contact by a bolt through the panel board. When they are used in parallel the connections are made by means of busbars which join the feet of the resistors so connected.

Taps are easily taken from the completed resistor at the feet, the connection being brought to the front of the board by means of a long stud.

This inverted V-shaped unit when firmly attached to the panel possesses extreme rigidity, and will maintain its position independent of expansion and contraction, even when heated, as under heavy load conditions. When certain nickel-chromium alloys are used, the metal may be operated at red heat without any noticeable diminishing of the strength of the unit.

Resistor units built according to this system have been given the name "Ribohm Units." The metal which is used in the ribbon may be any one of the resistor materials. Therefore, it may have a zero temperature coefficient if necessary.

Ribohm construction makes it easy to stock parts from which rheostats of any capacity or resistance may be quickly assembled. As at present constructed, Ribohm rheostats are made by assembling Ribohm units on board of suitable insulation. All internal or cross connections are made with straps or wires carried on the board. In many cases the Ribohm units connect directly to the contact segments of rheostats, thus eliminating the wire connections usually required. The insulating base with its resistor complete is then inserted in a cage which completely encloses all live parts.

Expansion, due to heating, is taken care of very effectively by this method of construction, in which no strains are exerted upon the terminals, units or connections. Ribohm units made of chrome-nickel alloys are practically as rigid when red hot as when cool, and may be run continuously at high temperature without deterioration.

The following comparison of Ribohm rheostats with cast iron grid rheostats intended for the same purpose is of interest. A Ribohm resistor unit designed for 3 kilowatts continuous duty occupies a space of 10x10x12 inches and weighs 8 pounds. and a Ribohm rheostat with 12 steps designed for 9 kilowatts continuous duty occupies a space of 18x18x21 inches and weighs 80 pounds. A cast iron grid rheostat for the same service as given above would weigh about 230 pounds. Generally speaking, a Ribohm resistor weighs approximately 25 to 30 per cent. of an equivalent cast iron grid resistor.

Our Steady Subscriber

How dear to our heart is the steady subscriber
Who pays in advance at the birth of each year.
Who lays down the money and does it quite gladly,
And casts 'round the office a halo of cheer.
He never says: "Stop it; I cannot afford it,
I'm getting more papers than now I can read."
But always says: "Send it; our people all like it—
In fact, we all think it a help and a need."
How welcomes his check when it reaches our sanctum,
How it makes our pulse throb; how it makes our heart dance.
We outwardly thank him; we inwardly bless him—
The steady subscriber who pays in advance.

—*Exchange.*

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Plain Tales of the Telegraph Lines
Ignominious Rout of the Growler Gang

By Robert Ellis.

White Pot was white hot when Odell's weary-legged wire stringing crew reached there close to high noon after a punishing morning drill from Long Island City. Their vitality was at low ebb when they struck the switching tower at this depressing landmark near the Dunton yards.

On their left some distance from the sloping bank of cinders a row of untenanted frame dwellings confronted the sweat-dimmed vision of the spur and reel strapped linemen as they hastily divested themselves of their climbing and bucking accoutrements.

The intervening strip of ground between the dangling rusty right-of-way fence and this uninviting scene of desolation was monotonously flat and sandy, ungarbed and unclothed, with nature's rich and green adornment.

A pair of sharp eyes could easily discern from the top of the embankment, over the dwarfed squatter huts and almost hidden in a recess of verdant maples on the main highway, a long two-story frame dwelling dressed in white and green trimmings, blending harmoniously with its immediate surroundings. It was not the picturesque effect of white and green colors on white pine boards, that commanded the undivided attention of the peering, squinting linemen. It was something more magnetic, more compelling of scrutinization—a large gilded sign framed securely under the projecting eaves, spelled the golden words "Gambrinus." The glare of the midday sun on the raised glittering letters intensified the desire of the men to become better acquainted with the owner of that alluring sign. After slaking their burning thirst once that morning in Gideon fashion in a convenient brook that babbled up the road a spell, this was a gift of the "Gods," and their newspaper-wrapped sandwiches of divers meats and cheese could now be washed down parched throats with copious draughts of cool lager beer. "It's 'otter than the 'ammers of 'ell," bitterly groaned Robinson, the limy liner, to his reel-mate, Tompkins, as they simultaneously unslung the leathern reel straps from their aching shoulders. "What's the matter with your glimmers, you sleepy-eyed lime juicer," said Tompkins, irritatedly, as he again turned to view the seductive sign. "So 'elp me, if it isn't a pub!" exultantly shouted Robinson, as he further studied the magic words, after being thus reproved by the sarcastic Tompkins. "I thought you would get it through your thick skull. 'Gambrinus' spells b e e r," shouted Tompkins gleefully to the slow-witted Englishman, as he vaulted the corroded wire fence and sprinted toward the promised land.

The day had opened up inauspiciously for the strenuous task of wire stringing, with broiling sun, cloudless sky and not a semblance of a freshening breeze to fan their feverish brows, as they started out of the Jackson Avenue yards to string a 210-pound copper to Jamaica. It was an inside wire and a mean one for the reel-bucking grounts to handle. With the adverse conditions they had to contend with on the trip down, it was not surprising that the gang was in rising spirits at their good fortune to come to a dinner halt at this oasis—a needed respite under unusually favorable conditions and they were going to take advantage of it very soon.

With Tompkins' abrupt disappearance across the sandy waste and noting Robinson's bungling fingers unfolding his crudely wrapped lunch, Foreman Odell drew out his reliable timepiece and said: "Well, boys, it ain't twelve yet, but it's so darn near it, you'd better put your feed bags on now." With this parting, welcomed invitation still ringing in their ears, they hurriedly withdrew from their doffed coat pockets dried-out, unsavory sandwiches, which they reluctantly refrained from eating, anticipating washing it down with "Gambrinus." They then called on one of their number, Bud Looney, whose duty that day was not so irksome, other than occasionally waiting on the clinging climbers, as they hung and tied in the field side wire, to rustle for beer cans. Looney acted with alacrity and unwonted dispatch, knowing full well that his thirst would be appeased, also. Fortune as well as the sun still smiled on the agitated crew, for Bud was able to persuade some of the Italian section men, who were working in the section adjacent to the tower, to part with five dinner pails. After the climbers had chipped in their share of the wherewith-all for the beer, five tousled headed, sunburnt groundhogs with the cockney Robinson in the van, were immediately enroute to the inviting hostelry, which seemed to beckon to them, each clutching securely an agate container. The climbers by right of spur and safety strap would wait where they were until their partners returned with the loaded pails.

Following a sunken path in the wake of the grunter Tompkins, Robinson and the other laborers were soon lined in front of a polished bar quaffing to their hearts' content foaming schooners of "Gambrinus" best. After satisfying in part their consuming thirst, they emerged from the inn with five cans filled to capacity with amber-colored fluid for their own consumption and that of the waiting climber sat the switching tower. All would have gone well on the return trip—the inner man could have been satisfied—the gang refreshed with stout ale, would have smashed wire-stringing records that afternoon—if the grunts hadn't been so boisterous and playful when they the second time that day approached the untenanted shacks. When Bud, the youth, in wanton deviltry threw a stone at one of the battered doors of a shack, the "God" of fortune commenced to frown on them. The thud of the heavy stone on the frail pine door awoke a pack of sleeping dogs, the canine raised Cain—their unceasing, bloodthirsty howling soon put a chilling fear in the new trembling grunts. When repeated lunges by the thoroughly aroused dogs threatened

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to yield a yawning gap in the panels of this scanty protection, the fear of the devil crept into their souls. Their progress was somewhat accelerated at this point, unmindful that the full containers must be carried carefully. When they thought they had put a considerable distance between them and the starved, locked-in mongrels, who were still roaring voraciously, they walked more slowly, for some of the beer had already moistened that Long Island sand, and that wouldn't do—but trembling hands still clutched the handles of the beer pails, nevertheless. "We're rid of them that time," jerked out Tompkins, as he turned his head around to view again the tenanted menagerie. He hadn't concluded his reassuring remarks to the other grunts, when out of the demolished door sprang a pack of ferocious, snarling brutes, a half-dozen in number, whose sinister intent was to devour their human prey. The dogs were on the cowering men before they had a chance to give them a solid front. Devoid of weapons of any kind other than the half-filled cans and what nature endowed them with, they could stand but little chance with these beasts. The impact of heavy agate pails on pointed snouts and shaggy heads and a deluge of golden colored beer, screening temporarily the eyes of the death-dealing beasts, marked the first few minutes of the battle between men and beasts. Discretion was better than valor in this case, and they were in a precipitate flight very quickly. It is needless to say the five agate cans were left on the battlefield more scarred than the combatants themselves. Divining that all was not well with the growler gang and that their thirst still remained unsatisfied, the climbers in a body resolved to look them up. When they approached the scene of conflict, it had resolved itself into a rout—a game of hare and hounds. The grunts were fleeting hares all right, for they just barely nosed out the frothy mouthed dogs to the railroad fence. The dogs, deprived of their cannibalistic repast, barked defiance, turned tail and leaped out toward the main road.

When Foreman Odell returned from Jamaica, where he was to get in touch with the main office for further orders, he was dumbfounded to note the changed appearance of the five grunts, who had thrown themselves down on the hard cinders in utter weariness after their mad scramble over the rickity fence to escape the teeth of the dogs. Eliciting no response from the prostrated men, after he had put the question to them, Odell managed to draw out of Hickson, the Straw Boss, the fact that they had a skirmish with a few mongrels and got what they deserved, for Hickson and the rest of the climbers were sorely peeved at being deprived of their liquid refreshment and were in no mood to console the prone grunts in their misfortune. Bud Looney, who at last gained tongue, gave him the harrowing details. This abject tale of woe struck a responsive chord in Odell's heart. Meditating a while, he spoke feelingly to the hapless groundhands. "You had a tough morning, a hotter noon, by crickity, but you will have a better afternoon. You can have the rest of the day off." Leaving them to drink in copious draughts of his welcomed words, Odell turned around to Hickson. "Hick, bring your climbers on with me; we have a lot of slack to pull up this afternoon."

It was well for the grunts that they got out of sight as quickly as they did after their dismissal by the indulgent boss, for a gang of swarthy Italian laborers with their instruments of trade were coming on to get their borrowed cans, which at that moment were lying in a misshapen heap on the arid soil. The grunts' disappearance staved off another royal battle with the sons of Italy that day.

Electrical Facts Worth Remembering

Naut.—The abbreviation of nautical mile, previously called "knot." The unit of length in submarine cable work equals 2,029 yards.

Potential.—The term potential is applied to electricity in the same way that the word pressure is used with reference to water. In its widest sense it is the power to do work.

Difference of Potential, or Electro-Motive Force (E. M. F.), determines the passage of electricity from one point to another, in the same way that difference of level gives water the power to flow from a point of higher pressure to one of lower pressure.

Current.—The passage of electricity from a point of higher to one of lower potential.

Resistance.—The obstruction offered by any body to the passage of a current of electricity through it.

Capacity.—The power of a body to retain a charge of electricity is called the electrostatic capacity of that body.

Volt.—The practical unit of E. M. F.

Ampere.—The practical unit of current.

Milliampere.—One-thousandth of an ampere.

Ohm.—The practical unit of resistance.

Megohm.—One million ohms.

Farad.—The practical unit of capacity.

Microfarad.—The working unit of capacity, one-millionth of a farad.

Coulomb.—The practical unit of quantity. The quantity of electricity contained by a condenser of one farad capacity when charged to an E. M. F. of one volt.

Microcoulomb.—The working unit of quality, one millionth of a coulomb.

Series.—Wires and batteries are said to be in series when they are joined up in one line.

Joint Resistance—The combined resistance of two or more resistances in parallel.

Shunt.—A conductor, usually a resistance box, for leading into another channel part of a current that is too powerful for the immediate purpose.

Circuit.—The path in which a current circulates from a given point back again to the same point.

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The Magnetic Club Dinner

The Magnetic Club Dinner took place at the Pennsylvania Hotel, New York, on the evening of Saturday, May 7th, over two hundred members and guests being present.

After an excellent dinner had been served, Edward Reynolds was selected as toastmaster in the absence of the president, J. J. Whalen, who was confined to his home by illness. He proved a skillful master of ceremonies. During the dinner, music, song and snapper sounder choruses enlivened the occasion, and a brief intermission before the speeches and entertainment began afforded an opportunity to greet old friends and get acquainted with new ones.

Mr. Reynolds read letters of regret from several members of the local committee who were unavoidably absent on account of sickness; also one from C. H. Mackay, who could not be present on account of a death of a member of his family in Italy. Telegrams of sympathy were sent to Mr. Mackay, also to J. J. Whalen, Joseph W. Flood and John A. Manning, expressing the goodwill of those present and regret at their absence.

Among the speakers were: J. W. Weed of Syracuse, who made an excellent address on the subject of "Business Getting." As a matter of fact, all the remarks made by the different speakers were of an educational nature. Most of them, however, were interspersed with humor which made them enjoyable and entertaining. Other addresses were made by Thomas J. Drew, of the Commercial Cable Company, New York; V. E. Blume, of St. Louis; Judge William C. Fitts, counsel of the Mackay Companies, New York, who entertained his hearers with humorous stories, and W. C. Daviet, of New York, who called upon the visitors from other cities one at a time to stand up and show themselves.

Those present were: C. E. Diehl, Harrisburg, Pa.; C. A. Richardson, Albany, N. Y.; E. Kimmey, Boston, Mass.; C. E. Bagley and J. H. Wilson, Philadelphia, Pa.; H. D. Reynolds, Buffalo, N. Y.; H. Scrivens and G. W. Grime, Pittsburgh, Pa.; Thos. P. Dowd, Washington, D. C.; John A. Vogt, Baltimore, Md.; J. W. Weed, Syracuse; G. H. Mills, Providence, R. I.; G. W. Ribble, Atlanta, Ga.; W. H. Stansell, Richmond, Va.; W. A. Boyle, Savannah, Ga.; G. T. Murray, New Orleans, La.; J. Hargrave, Dallas, Texas; E. W. Collins, J. Nering and W. L. Simpson, Chicago, Ill.; V. E. Blume, St. Louis, Mo.; S. H. Mudge, Kansas City, Mo.; J. J. Lynch, San Francisco, Cal.; A. C. Ackerman, F. Ackerman, A. Auslander, H. T. Boylan, J. A. Brizzi, R. J. Block, M. W. Blackmar, J. J. Barry, Jas. R. Beard, W. P. Brown, J. Burto, J. M. Barry, F. P. Brennan, J. J. Cardona, H. J. Casserly, J. F. Cleverdon, J. J. Cochrane, S. Cohen, C. A. Comstock, E. A. Coney, A. R. Coney, R. S. Crosskill, M. T. Cummisky, A. H. Clarke, P. F. Carl, T. J. Cassidy, R. H. Casserly, Dr. G. A. Cardwell, M. P. Cohn, W. C. Daviet, W. J. Deegan, J. A. Dupius, W. B. Dunn, T. J. Donovan, Thos. M. Drew, J. L. Enright, J. F. Farrell, J. Fitzgerald, V. F. Fiore, Judge W. C. Fitts, Wm. Finley, D. H. Gage, J. C. Gefvert, M. F. Geigle, W. M. Gibson, J. J. Ghegan, R. Gould, J. J. Griffin, P. Garvey, A. M. Gould, J. Goldhammer, W. S. Green, R. J. Hall, W. S. Hallett, T. E. Hammond, Geo. Harth, T. J. Horan, P. A. Hickey, J. L. Harkins, Walter Henshaw, J. F. Henry, T. S. Holmes, J. H. Hanley, Dr. L. R. Hallock, W. J. Kavanaugh, F. J. Kernan, O. C. Koehler, A. A. Kramer, A. F. Kavanaugh, I. K. Klutzman, W. L. Kearney, C. F. Leonard, A. M. Levenson, C. P. Linder, Edward F. Lippoth, F. Lechesi, D. F. Mallen, A. M. McNeill, J. F. McNeill, C. B. Mears, W. C. Michener, R. H. Miller, A. Montuori, C. J. Moore, A. J. Motto, J. H. Mayer, W. D. Morgan, J. J. McDermott, W. J. McNickle, M. A. McConnell, C. P. McInerney, L. A. Merrigan, A. Minori, H. J. Malony, W. J. Mitchell, A. H. McAdams, C. H. Maurer, J. A. McNulty, M. A. Meehan, F. E. McKiernan, Geo. W. McLoughlin, J. L. Mendolo, J. T. Needham, R. J. Needham, F. F. Norton, C. B. Obst, J. P. O'Donohue, C. W. Oram, F. A. O'Keefe, S. E. Ostrom, G. J. O'Brien, A. B. Parrish, F. J. Payne, C. F. Pearce, M. Pertka, F. W. Potts, W. J. Pallas, A. E. Pezzello, J. Privitar, Chas. Pritzia, Edward Reynolds, E. J. Rankin, Jr., C. R. Rimpo, Leo Rogers, Jas. Russo, D. G. Rogers, P. J. Rebecca, E. J. Rahtes, J. Richichi, D. F. Regan, C. Romano, J. F. Sheffery, C. Shirley, Daniel Shortall, J. F. Shugree, P. R. Shingler, E. A. Sprong, Wm. V. Stahl, J. F. Skirrow, I. Smith, D. Sullivan, L. Schwartz, W. B. Schreiber, W. A. Scriven, F. A. Suraci, Louis Starace, J. Shandley, H. L. Stern, W. J. Sweeney, E. P. Tully, J. B. Taltavall, J. H. Tierney, Edgar Thornburgh, R. J. Tyrrell, A. C. Teller, L. J. Tynan, E. M. Underhill, J. J. Wallace, R. E. Walsh, A. J. Ward, H. Wiese, H. E. Wilson, F. J. Woesser, J. J. Williams, A. Williams, F. J. Wilbur, W. R. Wheelan, J. T. H. Whittaker, C. Yacht, T. C. Zoebelein, H. Zweifel.

Telegraph and Telephone Life Insurance Ass'n

Assessments Nos. 697 and 698 have been levied by the Telegraph and Telephone Life Issurance Association, New York, to meet the claims arising from the deaths of Charles F. Reals, Kendallville, Ind.; Stephen L. Burts, Atlanta, Ga.; Richard Pfund, New York; Eugene B. Thompson, Harbor Grace, N. F.; Elizabeth A. Fitzpatrick, New York; Samuel E. Lumpkin, Charlotte, N. C.; Thomas W. Hill, Cleveland, Ohio; John W. Thompson, Nashville, Tenn.; and Thomas B. Adams, Nashville, Tenn.

The option to join the Third Division of the Association by the members will expire on June 30th. Those desiring to transfer to the Third Division will do well to take advantage of the intervening time.

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PERSONAL

J. C. HAGEN, general superintendent, Halifax and Bermudas Cable Company and the Direct West India Cable Company, Halifax, N. S., accompanied by his wife, arrived in New York last week from Bermuda, and he sailed for Turks Island, after spending a few days in the City. Mr. Hagen is making a trip of inspection of the companies' offices.

J. G. HAYES, president of the Western Union Employees' Association, Chicago, is in Nova Scotia on association work.

POSTAL TELEGRAPH-CABLE COMPANY

MARC ANTONIO C. DI STIGLIANO, aged thirty-two years, died in Italy of an illness contracted at the Italian front during the war. He was a grandson of Mrs. John W. Mackay and a nephew of Clarence H. Mackay, president, and was unmarried.

J. J. WHALEN, traffic manager, who has been absent from his office for several weeks on account of sickness, is improving and is expected back at his desk shortly.

AMONG the executive office visitors were: Southern Division—G. W. Ribble, general superintendent, Atlanta, Ga.; J. Hargrave, superintendent, Dallas, Texas, and Managers Murray of New Orleans, Boyle of Savannah, and Stansell of Richmond; Western Division—General Superintendent E. W. Collins and Division Engineer W. L. Simpson, Chicago; Superintendent S. H. Mudge, Kansas City; Managers John Nering of Chicago and V. E. Blume of St. Louis. Superintendent of Construction J. J. Lynch of San Francisco was also a recent visitor.

ALL of the Eastern Division superintendents were in the city on the occasion of the recent Magnetic Club Dinner, together with the following managers: J. H. Wilson of Philadelphia, G. W. Grime of Pittsburgh, C. E. Diehl of Harrisburg, J. A. Vogt of Baltimore, T. P. Dowd of Washington, G. H. Mills of Providence, and J. W. Weed of Syracuse. The superintendents included: H. D. Reynolds, Buffalo; H. Scrivens, Pittsburgh; C. E. Bagley, Philadelphia; C. A. Richardson, Albany; E. Kimmey, Boston, and C. F. Leonard, New York.

CHARLES E. SMITH, one of the best known operators in the Postal service in Boston, died on May 5th. He was identified with the main office since 1891, and worked the fastest circuits leading out of Boston. Since 1919 he was manager of the company's interests in the Boston *Transcript* office. He is survived by his wife, two daughters and a son.

Managers Appointed

H. L. Strock, Lorain, Ohio; A. R. Fox, Barberton, Ohio; Clara Miller, Newton, Ia.; C. N. Coates, Monrovia, Cal.; D. A. Hilley, Montezuma, Ga., and Donald Magary, Auburn, N. Y.

New York Operating Department

J. H. FLOOD, of the City Line Department, who has been recovering from the effects of a broken limb, was unfortunate enough to suffer a second fracture a few days ago. This recent accident will confine him to his home for some time.

JOHN MANNING, cashier, who has been in the hospital for several weeks on account of serious illness, is reported improving.

N. DARCEY, of the Service Department, has returned after an absence of three weeks due to illness.

W. C. CONNELLY, formerly of the Boston office, is now working first Chicago bonus.

Commercial Cable Company

THE cable steamer *Pacific* sailed from Shanghai, China, on May 1st to repair the Guam-Manila cable. Advantage will be taken of this occurrence to remove the cable to a safer route.

OFFLEY CREW READ, assistant superintendent at Shanghai, is on board as the company's representative.

MAYNARD DODD, electrical engineer for the Pacific, is in Japan.

T. E. HURDUS, assistant traffic manager, New York, has returned from Havana.

Magnetic Club of New York

At a meeting of the members of the Magnetic Club held on April 27th the following officers were elected for the current year: President, John J. Whalen; vice-presidents, William C. Daviet, John F. Skirrow and Edson Kimmey; secretary, William B. Dunn; treasurer, Joseph J. Cardona.

Members of the Board of Governors to serve until the next annual meeting: Daniel F. Mallen, James J. McDermott, Frank E. McKiernan and Charles Shirley; members of the Board of Governors to serve for two years, William J. Deegan, Joseph H. Flood, John A. Manning and Eugene P. Tully.

In the absence of the president, Vice-President Daviet appointed the following committees for the remainder of the year:

Entertainment committee: James J. McDermott, chairman; William J. Deegan, William P. Brown, Robert J. Hall, Phillip A. Hickey and Eugene P. Tully.

Membership committee: Warren S. Hallett, chairman; Curtis A. Comstock, William B. Dunn and F. Frederick Norton.

Finance committee: Charles Shirley, chairman; Harry W. Hetzel and John F. Skirrow.

Reception committee: J. P. O'Donohue, chairman; John Goldhammer, John Henry, Felix J. Kernan, Edson Kimmey, Daniel F. Mallen, Frank E. McKiernan, Alfred W. McNeil, Isaac Smith and John J. Whalen.

Considerable interest was manifested in the revival of the club and thirty applications for membership were acted upon.

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WESTERN UNION TELEGRAPH CO.

NEWCOMB CARLTON, president; L. McKisick, assistant to the president, and Rush Taggart, vice-president and general counsel, were in Washington on May 10th, testifying before the Interstate and Foreign Commerce Committee in regard to cable matters.

E. W. AMES, cable director, has returned to New York from South America.

Eastern Division

THE division offices of General Manager T. W. Carroll have been removed to the eighth floor of 195 Broadway, New York.

MRS. DELIA HOUK, mother of Miss Mary E. Houk, of General Manager Carroll's office, died at her residence, West New York, on May 9th.

MRS. CORA G. HOPKINS has returned from the South to take up the duties of relief manager, First District, during the vacation season.

R. J. COLE has been appointed manager at Tarrytown, N. Y., vice E. A. Blood, resigned.

C. D. SEAMAN, manager at White Plains, N. Y., has been detailed to the office of Superintendent W. A. Sawyer for special work. His brother, H. G. Seaman, is acting manager during his absence.

G. M. PENNOCK has been appointed manager at Wilmington, Del.

W. F. MACK has been transferred from Wilmington to Jersey City as manager.

H. KRAMER, manager at Jersey City, has been appointed district commercial agent, third district, Eastern Division, with headquarters at New York, in charge of commercial development work.

S. B. WILCOX has been appointed manager at Elizabeth, N. J.

G. K. WILKIN is acting manager at New London, Conn.

THE telegraph fraternity extends its congratulations to Mr. and Mrs. Donald Frazer on their wedding day. Mrs. Frazer was formerly Miss Marie A. Flohr, manager at Putnam, Conn. Mrs. Frazer will still retain the management at that place.

J. K. BRUGLER, assistant general supervisor of traffic service, New York, is spending two weeks at his home in Missouri.

C. E. FRANK, supervisor at Havana, Cuba, who has been in this country for some weeks, will return to Havana about the middle of the month.

New York Western Union

The Sixth Annual Dinner of the Western Union Bowling Association was held at the Arkwright Club on April 26th. There were about three hundred present. The entertainment and dinner was greatly enjoyed by all. The following prizes were awarded to the respective winners: Team Prizes—Commercial News Department, President Carlton, trophy and first prize; Cable Traffic, second prize; Accounting, third prize. Individual prizes, high averages: First, E. D. Pitt, Metropolitan; Second, W. A. Kampf, Accounting; Third, L. A. Pompliano, Cable Traffic; Fourth, J. H. Bligh, Metropolitan; Fifth, A. M. Bellis, Commercial News Department; Sixth, W. J. Larmon, Valuation; Seventh, B. Bernstein, Accounting. High Scores: First, W. C. Huston, Accounting; Second, A. L. Ashley, Metropolitan.

A. E. Wilgus, of the Commercial News Department, who has been absent on sick leave for the past five months, returned to service recently.

Returned from vacations: Harry Haworth and O. H. Browne.

Lake Division

A JOINT conference of division and district heads, city superintendents and staff men of the Lake Division was held on April 28th and 29th in General Manager A. C. Cronkhite's office in Chicago.

Superintendent J. J. Welch, Division Auditor W. McD. Milne, Superintendents E. Boening, H. Brown, A. R. McGrath and A. A. Montgomery, and City Superintendents F. B. Travis, C. H. Cadwallader, A. A. Brown, E. W. Grob, B. J. Ross, A. A. Burr and L. R. Scholl, and Division Commercial Managers Allen, Haas and Ragsdale participated in a general discussion concerning service matters.

General Manager A. C. Cronkhite was host to the members of the conference at a luncheon in the Grill Room of the Illinois Athletic Club on April 28th.

General Manager M. T. Cook of the Pacific Division, San Francisco, and Theodore P. Cook, formerly general manager at Chicago, were guests.

A poetic effusion addressed to his office associates by George C. Mason, poet laureate of the general manager's office at Chicago, was recently received. Mr. Mason with his wife is visiting the Pacific Coast on a two months' furlough and flaunts his freedom from carking care in poetry in the face of his erstwhile office companions.

The Florists' Telegraph Delivery Association placed a gorgeous floral setting in the big windows of the Milwaukee main office on May 1st, to be continued during "Mother's Day" week. The variegated tulips, roses, snap dragons, blooming plants and corsage and colonial bouquets in fancy baskets showed to advantage in a background of green composed principally of privet and other ornamental shrubs, ferns of different varieties and kentia palms.

A 4-wire miniature telegraph line with instruments cut in at the terminals (San Francisco and New York), and with Milwaukee looped in to the map in the center window, carried out the idea of sending flowers by wire. The line was cut in on a working circuit in the operating room and the cop-

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per wires stretched over the cross-arms on the miniature poles actually carried the current that operated the instruments in the windows.

A large map of the United States (painted on badger board) showing the principal cities in every State where the F. T. D. A. has an agency, was in the background of the center window, and the city of Milwaukee was marked thereon by a small incandescent lamp, which was lighted at night. The beautiful colors of the flowers made a bower that was admired by thousands of pedestrians.

It is a proven fact that these displays are actually effective in the promotion of sending flowers by wire.

General Manager Cronkhite and other Lake Division officials, as well as a number of the leading florists of Chicago, viewed the exhibit with hypercritical eyes and pronounced it par excellence.

Washington Park, Milwaukee, was the scene of the great Commercial-Traffic baseball game on May 1st. Captain Coogan led his doughty warriors on to the field of battle with every confidence that the blue ribbon of victory would perch on the Commercial banner. The team made good and turned in a 19 to 13 victory. It looked bad for the Commercial team at the end of the second inning, when the Traffic boys had driven ten runs over the plate, while the best the business gatherers could do was a pair of goose eggs. Several Commercial employees arrived about this time and began to root for their team. In the meantime they improved in their defensive work and held the opposing team to three runs in the last six innings. A return game is likely to be played in the near future.

SIDNEY A. RHODES, aged sixty-three years, for forty-three years manager of the Western Union Telegraph Company's office at Bellefontaine, Ohio, died at Springfield, Ohio, on March 13th.

ALVIN T. GOULD, aged seventy-seven years, for over thirty years chief operator of the Western Union Telegraph Company at Cincinnati, Ohio, until ten years ago, was killed by an automobile in Indianapolis on April 22nd. Mr. Gould was a native of Lawrence, Kan., where he entered the telegraph service in 1861, and almost his entire telegraph career was spent in Cincinnati. A handsome floral piece was sent to Indianapolis from the Cincinnati friends of Mr. Gould.

Los Angeles

H. H. Cooper, manager of the Southern Pacific General Telegraph Office, Los Angeles, Cal., has returned to duty, after a prolonged absence, during which time his left limb was amputated at the Southern Pacific Hospital, in San Francisco. After his recovery he married a principal of one of the Los Angeles schools, and he and his wife are now living at Glendale.

Capt. E. M. Joyce, late of the United States Army Signal Corps, has written and produced a play which was staged at Wilcox and Johnson, Ariz., and which met with great success. Mr. Joyce represented the leading man.

The navy wireless system on May 1st inaugurated a commercial communication service between the United States and Indo-China.

The new service, according to announcement by the navy, will be conducted by way of the Hawaiian and Philippine Islands.

The provisional agreement arranged between the governmental authorities of French Indo-China and the naval communication service, the Navy Department announced, provides that the new commercial service will embrace radio communication across the Pacific via the American naval radio stations at San Francisco, Pearl Harbor, Guam and Cavite, and the French radio stations at Saigon and Haroi in Indo-China, Cavite communicating with the French stations.

P. C. KULLMAN & COMPANY, the wireless brokerage house, has removed from 35 Nassau Street to 110-116 Nassau Street, New York, where they will have additional space to take care of the growing demand of their business. Kullman and Company were located at 35 Nassau Street for four years, and for fifteen years previous to that time at 68 Wall Street. The firm makes a specialty of all radio stocks.

AN appropriation of $45,000 has been asked by Chief Lyle Pendegast of the Los Angeles, Cal., Police Department for the installation of an internal police telegraph system to increase the efficiency of his department.

The proposed telegraph system would connect all of the sub-stations with the central police station and would be operated by trained telegraph operators.

Obituary

T. W. HILL, aged seventy-three years, vice-president of the Guardian and Savings Trust Company, Cleveland, Ohio, died of pneumonia on March 8th. Mr. Hill was a native of Michigan, where he learned telegraphy and had occupied many important positions in the service, including the managerships at Detroit and Cleveland for the Western Union Telegraph Company. Mr. Hill took a prominent part in the entertainment of the Old Timers at the Cleveland Reunion in September, 1919.

ELMER A. HOWARD, aged sixty-two years, vice-president of the Chicago, Burlington and Quincy Railroad and one of the best known railroad executives in the country, died in Chicago on May 4th. He began his career as a telegrapher. During the administration of President Cleveland he served as Indian agent.

WILLIARD L. CANDEE, aged seventy years, well known in telegraph and electrical circles, and president of the Okonite Company for over twenty-five years, until his retirement six years ago, died in Brooklyn on April 24th. Mr. Candee was one of the telephone pioneers of America.

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CONTENTS

Carrier Current Telephony and Telegraphy. By E. H. Colpitts and O. B. Blackwell. (Continued from page 219, May 16th issue)..... 242

The Recent Electrical Disturbances 244

Circuit Details of the Connector Switch. By Harry E. Hershey. (Continued from page 226, May 16th Issue) 245

Famous Morse Elm Removed, Long Washington Landmark. The Telephone Society of Boston, Mass. 246

History of the Morse Statue in Central Park. By John Horn, Montreal. 247

Judge Mayer Sustains Armstrong Radio Patent 249

The Annual Proceedings of the Old Timers' Toronto Reunion. Cable Connections in Mexico Needed. Selenium a Rare Element..... 250

Student's Course in Technical Telegraphy. By Louis Casper. Lesson 28 251

Earth Boring Machine 253

Editorial Comment—Pension Bill for the Relief of United States Military Telegraphers. Loyalty. Faith is in Wireless for Long Distance Telephone 254

The Railroad—Telegraph and Telephone Section of the American Railway Association—Specification for Wire Crossings Over Railroads. Death of Louis H. Korty 257

The Use of a Spacing Wave in Continuous Wave Wireless Telegraphy. By E. H. Shaughnessy, O.B.E., M.I.E.E., M.I.Rad.E. 259

Thomas H Brooke, Sixty-two Years in the Service 260

Jimmy, Mascot of Messenger Boys, Laid to Rest in Grave Under Elm Tree 261

Personal. Postal Telegraph-Cable Company 262

Western Union Telegraph Company. Canadian National Telegraphs... 263

Radio Corporation of America. All America Cables. Inter City Radio Company Seeking to Enjoin United States 264

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Carrier Current Telephony and Telegraphy

By E. H. Colpitts and O. B. Blackwell.

(*Continued in part from page 219, May 16 issue*)

Harmonic Generator. In order to insure that the carrier current applied to the demodulator in this system, employing suppressed carrier, is of exactly the same frequency as that used for modulation at the sending end, an arrangement has been devised whereby both of these frequencies are derived from the same source. For this purpose at one terminal of the system a vacuum-tube oscillator generates a frequency somewhat above the voice range—say 5000 cycles. Current of this frequency is applied to the input of another vacuum tube in such a way as to overload it. This "harmonic generator," as it has been termed, is so arranged that the current in its output circuit has a distorted wave-form containing prominent components whose frequencies are exact multiples of the applied frequency. The various harmonics of the base frequency (in this case 10,000, 15,000, 20,000 cycles, etc.) are separated by suitably designed selective circuits and led into individual circuits, where they are amplified and made available for use as carrier currents, each in connection with a different channel. At the same time, current of the base frequency from the controlling oscillator, in this case 5000 cycles, is amplified and transmitted over the line to the other terminal. Here it is separated out by a filter, amplified and applied to a second harmonic generator, which produces the same series of carrier frequencies as does the harmonic generator at the controlling station already referred to. These regenerated harmonics may not only be used for demodulating the transmissions received from the controlling terminal, but may also be used in connection with balanced modulators which send in the reverse direction. The demodulators at the controlling station are supplied with carrier current from the harmonic generator at that terminal.

The suppressed carrier system, besides employing smaller line currents, has two other important advantages. One is the absence of audible beat notes resulting from interaction in the demodulating circuits between the carrier frequency normally present and others which may be present through cross-talk or lack of perfect balance. Where all of the carrier frequencies are generated separately, these combination frequencies may in certain cases give rise to disturbing tones within the voice range With the harmonic arrangement, on the other hand, the only possible frequencies are differences of the base frequency itself and its harmonics, all of which are above the normal voice range, and accordingly are suppressed by the low-pass filter in the output circuit of the demodulator. As a matter of fact, this harmonic arrangement is practically essential where the same frequency range is used for both directions.

The second advantage arises from the fact that variations in the attenuation of the line, due to weather changes or other causes, have less effect on the transmission equivalent of the system where the carrier frequency itself is not transmitted. This will be clear when it is recalled that the magnitude of the voice current in the output of the demodulator is proportional to the product of the amplitudes of the carrier and side band currents. If, therefore, the change in line attenuation is such as to increase or decrease the side band current by a given ratio, the carrier current when transmitted will in general also be changed in the same ratio, and the resulting voice current will be changed by the square of this raito. In the suppressed carrier system, on the other hand, while the side-band is changed as before, the carrier is increased or decreased—not by the change in attentuation which occurs at the carrier frequency, but by the changes, in general much smaller, which occur at the base frequency, so that the voice current is less affected in this case.

Repeaters. From the discussion of the transmission characteristics of lines which will be given later the very great practical importance of amplifying apparatus at intermediate points on a line employing carrier frequencies will be evident. For this purpose, fortunately, we have available, first, the vacuum tube, and, second, a large variety of methods of applying this tube which have been developed to a high state of efficiency in connection with the voice-frequency telephone repeater. While, as just indicated, the same general considerations apply to repeaters for carrier current circuits as to repeaters on circuits operated at voice frequencies, the conditions peculiar to carrier current operation require that the repeaters for this service differ quite considerably from standard voice frequency repeaters.

In the first place, on a multiplex carrier current circuit a single repeater installation must handle the energy associated with a number of independent conversations. This could be accomplished by making the installation include a number of repeaters in parallel with suitably associated filter combinations, but it is at once obvious that it is much preferable to install but one repeater channel capable of amplifying all the carrier transmission. The requirements for the repeater set are made still more severe by the fact that modulation in the repeater tubes, which tends to increase with the load, introduces disturbing factors in carrier operation which are not serious in ordinary repeater operation. The reason for this is that the combination frequencies resulting from the interaction of the currents in two channels may lie in the frequency range of a third, in which case they are transmitted through the selective circuits of that channel and appear as an interfering noise or tone at the subscriber's station. To obtain sufficient energy carrying capacity, and to overcome to some degree this difficulty of intermodulation, we use a number of tubes in parallel in the so-called "push-pull" arrangement.

In this arrangement the input voltage is applied in such a way as to increase the grid voltage of one

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tube with respect to its filament at the same time that the grid voltages of the other is diminished. The plates are connected with the output circuit by a differential transformer, so that the useful amplified currents from the two tubes are added, while the more troublesome interfering components due to modulation are equal in amplitude and opposite in phase, and hence are balanced out. Instead of employing tubes in parallel to increase the energy capacity of the set, it would have been possible to have used a single tube of larger energy capacity. The scheme of using a number of tubes operating in parallel was adopted in order to avoid increasing the number of types of tubes in the plant.

In repeater operation at voice frequencies, the amount of amplification which can be secured on a given line and with given types of repeater apparatus is limited by the tendency to "sing." The same is true for repeater operation at carrier frequencies. To reduce the tendency of the repeater to sing, the same methods may be adopted as are employed at the terminals; that is to say, if the same frequencies are used for the transmission in both directions, the lines on either side of the repeater must be balanced and the same general type of repeater circuit used as for voice frequency telephone repeaters. If, however, different frequencies are employed for transmission in the two directions, filters may be used to prevent the current sent out in one direction from passing into the input circuit of the repeater set which receives energy from that direction.

While the telephone currents at voice frequencies may be amplified in the same repeater along with the carrier currents, it has been found convenient for reasons of plant flexibility to separate voice-frequencies from carrier-frequencies by line filters similar to those used at the terminals. Due to the fact that the attenuation of voice-frequencies is much lower than that of carrier-frequencies, it is frequently not necessary to install a voice frequency repeater at all of the points where carrier frequency repeaters are installed.

Signalling Over Carrier Telephone Circuits. For a carrier telephone channel to form an integral part of an ordinary telephone connection, it is in general desirable to be able to operate the normal signaling mechanism over the channel without the intervention of an operator at the terminals of the carrier section. This is accomplished by two distinct methods in the two types of systems employed. In the type where carrier current is transmitted over the line, an auxiliary rectifier tube is associated with the demodulator in such a manner that the incoming carrier current produces in the output circuit of this rectifier a direct current sufficient to maintain a relay in its operated position. When the operator signals, the ordinary 16-cycle ringing current is received at the carrier terminal. This is made to operate a relay, which disconnects the source of carrier current from the modulator, thereby stopping its transmission over the line. As a result, at the distant terminal the relay controlled by the rectified current falls back, causing an ordinary 16-cycle ringing current to be sent out over the connecting line associated with that particular channel.

In the system where the carrier current is suppressed, the 16-cycle ringing current from the low-frequency line operates a relay which applies to the modulator, through the speech circuit, a current of 133 cycles from a vacuum-tube oscillator or other source. This current interacts with the carrier current in the modulator to produce a side band current, differing from the carrier by 133 cycles, which is transmitted to the distant terminal. Here it is demodulated and appears in the voice frequency circuit as a current of 133-cycle frequency. This current operates a relay tuned to this frequency, which in turn serves to send out 16-cycle ringing current over the low-frequency line.

Telegraph. Carrier current telegraphy is based on the same fundamental principles as carrier current telephony, but in actual operation it employs somewhat different physical arrangements, owing to the differences in the nature of the signals to be transmitted and to the differences between the operating conditions met in the two cases.

In ordinary telegraphy the signaling current consists of a succession of so-called "marking pulses" separated by intervals of zero or oppositely directed current representing spaces. In transmitting telegraph signals over a line by the carrier method, the signaling current, as received from the local telegraph trunk or from a connecting long-distance telegraph line, operates a relay which controls the application of carrier current to the high-frequency line. The usual arrangement is such that high-frequency current of uniform amplitude is sent out during the marking intervals only. At the receiving terminal this high-frequency current is rectified, generally after amplification, by a vacuum tube. The resulting rectified current operates a relay, which in turn sends signals over the connecting telegraph circuit or loop.

It has sometimes been assumed that the only frequency transmitted under these conditions is that of the carrier, and that, therefore, the only limitation on the frequency intervals between the carriers of adjacent channels is that imposed by the degree of selectivity possible of attainment with actual physical apparatus. That this is not the case is easily seen from a consideration of the building up and decay of current in a sharply resonant circuit. If the time required for the current to build up in such a circuit is comparable with the lengths of the marking and spacing intervals, the high-frequency current will not accurately reproduce the telegraph signals. This causes a rounding off of the signal, or, if sufficiently extreme, the signals disappear altogether.

To determine quantitatively the relation between the constants of the selective circuits and the speed and quality of the signals, it is most convenient to regard the problem as a case of modulation. As in telephony it was shown to be necessary to transmit a band of frequencies equal in width to the voice

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frequency range, similarly in carrier telegraphy it is necessary to transmit a band of high frequencies corresponding to the important frequencies present in the direct-current telegraph signals, an analysis of the ideal current wave representing a succession of telegraph signals reveals the presence of an infinite series of components whose frequencies extend to infinity and whose amplitudes decrease with increasing frequency. Ordinary telegraph circuits transmit only components of comparatively low frequency, with the result that the signals are rounded off. Reasonably good signals are secured, however, if those components are preserved whose frequencies are a few times the fundamental interruption frequency. The upper limit of this essential frequency hand varies with different types of apparatus and with different grades of service required, but it is for any one set of conditions roughly proportional to the speed of signaling. For the cases so far met with in practice, it is of the order of 100 or 200 cycles. It follows, therefore, that while a modulated wave, whose envelope approximates ideal telegraph signals, would require the transmission over the line of a very wide band of frequencies, satisfactory operation requires the transmission of a band of frequencies equal only in width to the essential frequency range of ordinary telegraphy.

(To be Continued)

The Recent Electrical Disturbances

Disturbances of telegraph systems on May 7th and 8th and like disturbances on both sides of the Atlantic are due, according to the theory of some astronomers, to "Alpha particles" from the sun. The theory that sun spots are responsible is regarded as most probable. Sun spots shoot off Alpha particles, which are smaller than atoms.

The particles, none of which ever has been seen by either the naked or the miscroscopically equipped eye, are attracted by the magnetic poles of the earth on their arrival, but dissipate their energy through the bright display known as the northern lights, or aurora borealis, and through playing havoc with telegraph systems. Wireless systems are not hindered by the particles. The difference between the two systems is that telegraph systems use the earth, and radio uses the air. Why this makes a difference in the behavior on them of the particles no one has been clever enough or bold enough to state.

The nature of the subatomic particles from the sun is not known exactly, but because of their influence they are supposed to be in some way akin to radium.

All of this is theory, but the supposition is more probable than is any other.

There is little doubt there is a connection between the sun spots and the aurora, although this is also theory. The reason for this belief is that every time there has been an aurora, sun spots have been observed simultaneously.

The influence may be due to the radiation of Alpha particles from the breaking up of atoms in the sun, though there is doubt when we go this far.

The energy of the subatoms is used up in the electrical displays, but where it goes from there is still another question. The course of the particles is bent considerably by the earth's magnetic poles.

In speaking of the effect on telegraph systems, it has been noticed that wireless messages pass better at night and at times when the sun is in complete eclipse, but there is no theory to account for the fact.

Damage to the Atlantic cables by the electrical disturbance accompanying the aurora borealis may necessitate considerable repairs.

Traffic on the cables under the ocean was interrupted from time to time during the disturbance, and damage of a serious nature caused by the stray electrical currents, which played havoc with all long-distance communications.

The electric disturbance on May 7th and 8th was much the worst ever experienced. A great many fuses were blown out on land lines.

A fire which destroyed the six thousand dollar Brewster, N. Y., testing and signal station was caused by the aurora borealis, in the opinion of officials. The operator on duty was driven away from his instruments by a flare of flame which enveloped the switchboard and ignited the building.

The disturbance was reported by cable to have burned out a telephone station in Sweden. It may have contributed to a short circuit in the New York Central signal system, followed by trouble in many of the towers. According to cable dispatches, it interfered with telephones, telegraphs and cables over many parts of Europe. In this country, where interferences with telegraphing were serious, stray and variable currents of 1,000 volts were registered by meters, according to the reports of telegraph wire chiefs.

The disturbances are bound to be more intense in one place than in another, and the electrical apparatus might be arranged so as to be more susceptible to it in one place than in another. It might have isolated effects like those of lightning. The ground currents were about as capricious as the aurora itself, and will be long remembered by those who had to deal with the situation.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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Circuit Details of the Connector Switch

By Harry E. Hershey of the Automatic Electric Company, Chicago.

(*Continued from page 226, May 16 Issue*)

Manual Practice as Contrasted With Automatic

The called subscriber having answered, it is now necessary for us to provide means for feeding talking battery to both the calling and called subscribers. As it is beyond the scope of this article to go into the theory of the transmission of speech, it will suffice to say that the transmitters at the substations are of the common battery type. The receivers are direct current receivers, i. e., they have no permanent magnet, but use an electro-magnet and are connected in series with the line and transmitter during the conversation.

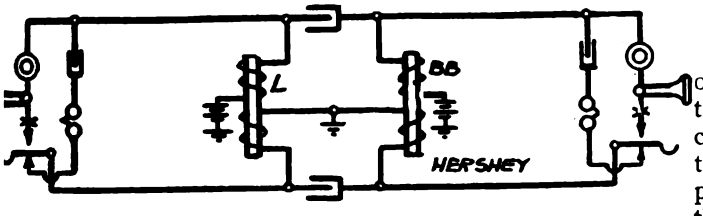


Fig. 13. Automatic Battery Feed

The Hayes method of supplying talking battery has come into very extended use in manual telephony. At the central office are two repeating coils, each having two windings. The inside ends of the two windings of the first repeating coil are joined together and connected to negative battery. The outer ends of the two windings form one side of the calling and called line, respectively. In a similar manner the inside windings of the second repeating coil are joined together and connected to positive battery. The outer ends of the two windings form the other side of the calling and called lines, respectively. Any changes in the current in either circuit produced by one of the transmitters will act inductively through the repeating coils upon the other circuit, causing corresponding fluctuations in circuit to flow through that circuit and actuate that receiver.

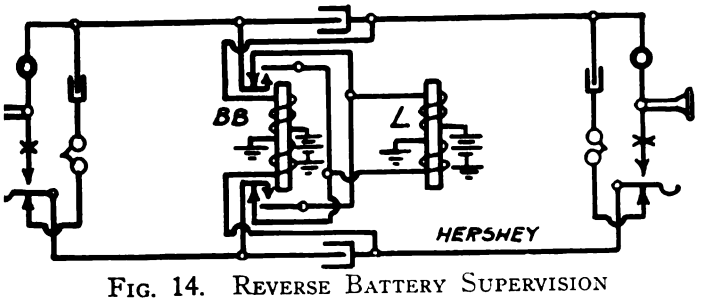


Fig. 14. Reverse Battery Supervision

In Fig. 13 is shown the method of supplying talking battery used in Automatic Connectors. It will be seen that each line draws its current through a separate impedance coil. In this plan, instead of depending upon the electro-magnetic induction between two sides of a repeating coil, as in the Hayes system, the electro-static induction afforded between the plates of two condensors is depended upon for transmitting the fluctuations in current from one line to the other.

Reverse Battery Supervision

Referring to Fig. 13 we find the well-known line relay L, which is here used as battery feed. The relay BB is termed the back bridge relay and feeds battery to the called subscriber. If a call originates at a toll board, for instance, it is essential that the operator be notified when the called party answers. Therefore, we may say that supervision is the result

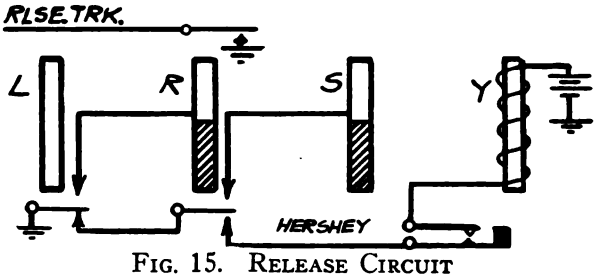
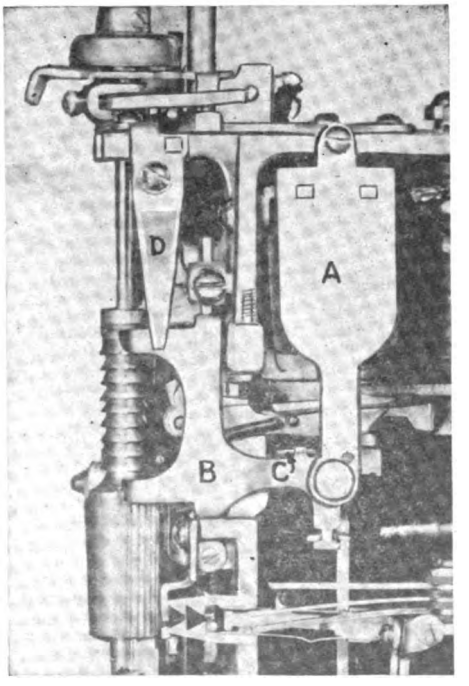


Fig. 15. Release Circuit

obtained when the conditions are so arranged that the answering of the called subscriber produces a change in the calling line such as can be utilized to give a visual indication of the fact that the called party has answered. Reverse battery supervision is the scheme usually used in Automatic Practice. Referring to Fig. 14, it will be seen that the line relay L is connected to the calling line through the springs of the back bridge BB, in such a manner that should the latter be energized the polarity of the calling line will be reversed. This reversal of the battery on the calling line may be used to give supervision at a manual board.



A—Release Armature. B—Double Dog. C—Release Link. D—Double Dog Spring

The Release of the Connector Switch

In the May 1st issue we discussed the mechanism

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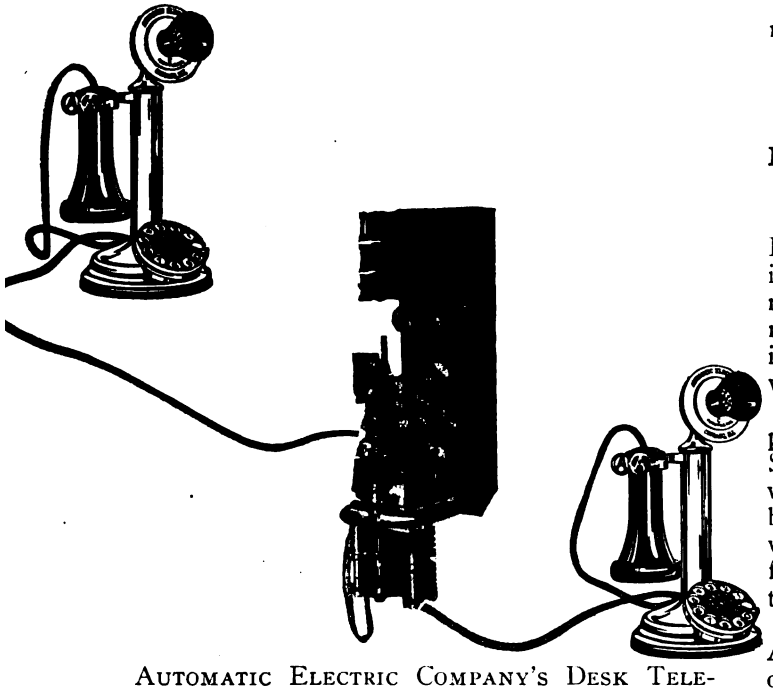
of the connector switch, and, among other things, mentioned that the double dog (see Fig. 6) was utilized to hold the shaft in an operated position. After the completion of the conversation it is necessary that means be provided whereby the double dog may be removed, thus allowing the shaft to return to normal. This action is accomplished mechanically by the use of what is termed a release magnet. Referring to Fig. 15 we have the familiar line relay L, release relay R, series relay S, and in addition the release magnet Y, which is usually of 100 ohms resistance.



AUTOMATIC ELECTRIC COMPANY'S DESK TELEPHONES AND CONNECTOR SWITCH

It will be remembered that the release relay R energizes as soon as the receiver is removed, and that it remains energized throughout the dialing period and during the conversation. Therefore, the circuit of the release magnet Y remains open at the springs of relay R, even though the "off normal springs" are closed at the first vertical step. After the conversation is completed and the receiver is returned to the switch hook at the calling substation the line relay L releases. A fraction of a second later the release relay de-energizes and closes a circuit which may be traced from ground, break springs relay L, break springs relay R, "off normal springs," through release magnet Y to negative battery. The release magnet will energize over this circuit and operate to remove the double dog, following which its own circuit will be opened at the "off normal springs" as soon as the shaft reaches normal.

The release relay also carries a pair of make springs by means of which ground is placed upon the release trunk. This is a standard feature of all Automatic switches and the term "release trunk ground" will be frequently met with.

QUESTIONS

A. In Fig. 13 would the transmission be effected if both condensers were short circuited, assuming lines of equal resistance?

B. In Fig. 14 what would be the result if relay BB pulled "half way up," i. e., energized sufficiently to close the make contacts but not enough to open the break contacts?

C. If one side of the line tested open to a reverse battery connector where would you look for your trouble?

D. What result would you expect if the off normal springs failed to break? Fig. 15.

(To be Continued)

Famous Morse Elm Removed, Long Washington Landmark

The famous Morse elm tree at the corner of Pennsylvania Avenue and Fourteenth Street, Washington, D. C., one of the oldest landmarks in the national capital, is gone. It was removed at midnight, May 14th, after a long but losing fight for its life which began when Fourteenth Street was widened some years ago.

This tree had looked down upon every inaugural parade held in Washington. It was named for Samuel F. B. Morse, inventor of the telegraph, who, tradition relates, in the early forties often sat beneath it and recited to interested listeners the wonders of the telegraph. In the olden days many famous politicians also would gather in its shade to discuss affairs of party and state.

The trunk of the tree has been presented to the American Forestry Association. The elm was one of the first trees to be given a place by this association in the Hall of Fame of trees with a history.

In this connection it will be interesting to note that Thomas E. Fleming, secreary of the Old Time Telegraphers' and Historical Association, New York, secured some of the wood from the old elm tree, and J. J. Ghegan of New York has had two gavels made of it. One of the gavels will be presented to George D. Perry of Toronto, president of the Association last year, and the other gavel to remain the property of the Association, to be used annually at the reunions. The latter mentioned gavel will have placed on it a silver plate appropriately engraved, thus making a part of this old elm tree the official gavel of the Association.

The Telephone Society of Boston, Mass.

J. Frank DeChant, director of the Sheldon Department, Burdett Business College and Sheldon School, gave a talk on May 17th on "A Few Fundamentals That Every Telephone Supervisor Ought to Know," at 50 Oliver Street, Boston. A large number of the fraternity took advantage of the occasion to add to their knowledge on this important subject. Gordon S. Wallace is secretary and Stanley B. Macomber is treasurer of the society.

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History of the Morse Statue in Central Park

By JOHN HORN, Montreal.

In the TELEGRAPH AND TELEPHONE AGE of May 1, 1911, there appeared an article on the dinner of the Morse Electric Club held at the Savoy Hotel, New York, April 6th. The president of the club, J. B. Van Every, asked if there were any persons present who attended the Morse farewell reception at the Academy of Music, New York, in 1871; if so, to stand up. Only eight answered to the summons. When it is remembered that more than a thousand persons thronged the Academy of Music on that occasion, and the few who had just responded, the thought must have been very impressive to those present.

As one who took an active part in the Academy of Music program, though somewhat behind the curtain, I send you some particulars of the memorable event which is written to the best of my recollection after a lapse of fifty years.

SAMUEL F. B. MORSE

I was then manager of the Western Union Telegraph Company's branch office in the New York Stock Exchange, Broad Street. I was on the best of terms with that good man, the late James D. Reid. The Academy of Music event was the closing one in connection with the erection of the bronze life-size statue of Professor S. F. B. Morse in Central Park, New York, through $1.00 subscriptions received from all over the United States and Canada. The suggestion of the statue came from R. B. Hoover, manager of the Western Union Telegraph Company, at Alleghany City, Pa., now living in retirement at Los Angeles, Cal., in a letter to the *Journal of the Telegraph*, of which James D. Reid was the editor. Mr. Reid endorsed the idea and acted as treasurer of the fund. It took but a little time to collect some $25,000. Byron M. Picket, the sculptor, was selected, and he made a good art reproduction of Professor Morse.

The day after the final erection of the statue I met Mr. Reid, who said he was going to hire the Academy of Music to entertain the telegraph fraternity in connection with the unveiling of the Morse Statue. To defray the expense of the Academy, he had tickets printed, to be sold to all who wished to be present. I did not like this, and at once said: "No, Mr. Reid, we will give the boys a free entertainment. I will help you, and we will raise the money to pay this expense, and I promise to get all the necessary support. I'll give $5.00." He replied, "Well, John, I guess you are right; I'll give $5.00, too." "Good, go to work, get the Academy; I will help you through." This was agreed to and we parted. I then went among those big-hearted men, many of whom I knew personally, my customers, the "Bulls" and "Bears" of Wall Street, the members of the Stock Exchange, and I raised all the money that was necessary. It will be remembered, everyone had reserved seats, and no charge was made. Mr. Reid kindly placed at my disposal many tickets and some private boxes to use as I thought best. I did all I could to hunt up all persons engaged or connected with the early development of the telegraph. I gave one of the boxes

MORSE STATUE, CENTRAL PARK, N. Y.

to Mrs. Alfred Vail and family, from whom I afterwards got an acknowledgment. I also gave a box or reserved seat to the veteran pioneer and builder of many of the early telegraph lines throughout the South and Northwest, Henry O'Reilly. I sent tickets also to Captain W. W. Pell, who brought Professor Morse across the Atlantic from Europe on his sailing vessel, the

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Scully, on board of which in 1832 Morse conceived the invention of his telegraph. Many other prominent people were present whose names I have forgotten.

Mr. Reid suggested I should act as chairman of the meeting, a compliment I respectfully declined, but suggested Colonel Marshal Lefferts, who at the time was chief electrical engineer of the Western Union Telegraph Company. The Colonel accepted the chairmanship, and I purchased the two large vases of flowers that were prominent on the front of the stage that many will remember, and which appeared in the illustrations printed in the accounts published in the telegraph journals of the day. I thought it would be nice to have some of the best and brightest of our young colleagues from the branch offices in New York act as honorary ushers at the Academy that evening. Among those who consented to act were J. B. Page, manager of the Metropolitan Hotel, who died in Montreal some years ago; Frank Marsh, manager of the New York Hotel; Joseph A. Burnham, manager of the Fifth Avenue Hotel, and some others. They all looked very nice in their swallow tails, but, alas! the plan did not work; they did not know the lay-out of the House. The guests were arriving fast, and confusions were evident, when I at once took in the situation and hired the regular ushers, who soon straightened out the tangle—to the relief of the amateurs. I acted as a committee of one to receive and look after the front of the house, while Colonel Lefferts and Mr. Reid did the honors on the stage, although President William Orton of the Western Union Telegraph Company was much in evidence, and acted as chairman.

A table was placed in the center of the stage, on which was a large heavy original Morse paper register now in the Museum at Washington.

One year had scarcely passed when Professor Morse was required by the King of Kings to give back the life he had been appointed to keep. Thus on the 2nd of April, 1872, with the courage that distinguished him as a Christian, he passed to the Supreme Ruler of the Universe for which he had striven to direct his thoughts and discipline his life.

The Academy of Music in New York was, I think, the largest and finest place of amusement in the city at that time—the home of Italian and German opera, and had possibly the largest seating capacity of any place of amusement.

History tells us that in following the course of telegraphic history, all allusion to Professor Morse, after his invention was fairly launched by the organization of telegraph companies to give it to public employment, has been purposely suppressed. He was a man of so fine a mould, and he stood related to telegraphic labor so paternally, that it seemed unnatural to connect him with its contests, although inseparable from its development. In the course of time this sentiment of filial recognition found expression by a proposition, voiced with wondrous unanimity throughout the continent, to give him some token of the universal honor in which his name was held.

The honors due to him by his own country had been left until his sun had nearly set. He had long since passed the life limit of threescore years and ten. His victory had been hard fought for, but had been won. His eye was still bright, and his step firm; yet he stood on the verge of fourscore years, and the zest for the world's laurels naturally grew weak. It was evident that any designed honor of which he was to be the living recipient must be quickly carried into effect.

In Europe every prominent power had bestowed on him tokens of esteem. The Emperor of Russia, the King of Denmark, Europe's great savant Alexander Humboldt, the Emperor Napoleon III, the Queen of Spain, the Kings of Portugal, Italy and Prussia, and many others had decorated him with insignias of merit. The Sultan had put upon his breast "Nishan Iftichar," the order of glory. Even England and her electricians had given him a banquet. It was now in order for America to recognize her great citizen.

In 1868 leading citizens of the country invited Professor Morse to a public banquet, designed to honor him, which he accepted. It was a memorable assemblage of representative men, and was presided over by Chief Justice of the United States Supreme Court Salmon P. Chase, then in his prime. The company was notable for its highly intellectual character. To Professor Morse it was the testimony of the nation to his merits as man, citizen and benefactor. The tributes paid to him by men of silvery tongue he accepted reverently and gratefully. "I have claimed," he said in an address of characteristic modesty, "for America the origination of the modern telegraph system of the world. Impartial history will, I think, support that claim. But I am sure I have your full sympathy when, in the sincerity of a grateful heart, I use the words of inspiration in ascribing honor to Him to whom, above all others, it is pre-eminently due, when I say, not 'what hath man,' but 'what hath God wrought.'"

William Orton, president of the Western Union Telegraph Company, presided at the Academy of Music reception. He delivered the introductory address, Dr. Loring, of Salem, Mass., following. The band had played the Morse Telegraph March, composed for the occasion by Bandmaster Wiegand. Dr. G. W. Sampson had delivered his address on the "Influence of the Telegraph on Literature," when the exercises were interrupted.

(*To be continued*)

Cable Map of the World

The International Bureau of Communications, located at Berne, Switzerland, has issued a map showing the cables of the world. The map measures 21 inches long by 25 inches wide. There are fifty-five submarine cables shown on the map. Copies can be obtained at 50 cents each from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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Judge Mayer Sustains Armstrong Radio Patent

As a result of litigation extending over a period of years, the Armstrong radio "feedback" patent, controlled by the Westinghouse Electric and Manufacturing Company, has been held valid by Judge Mayer.

This patent covers what is probably the most important circuit arrangement in use in modern radio. It made possible trans-oceanic radio communication and has contributed much to the art of radio telephone communication.

The feedback circuit magnifies the signals received by wireless instruments thousands of times, so that signals previously inaudible are now easily readable, and it further permits of very great selectivity, making possible reliable communication between two stations regardless of atmospheric conditions and of the transmission of messages by other stations.

Judge Mayer, in his opinion, says:

"This case is another contribution to the romance which has so often characterized the history of forward inventions. As a boy of fifteen, Armstrong became interested in radio and erected a radio station at his home. In the spring of 1912 he began a close study of the fundamental action of the audion and read all the literature on the subject. Some time during this period he connected a condenser across the telephone of a simple audion receiving system and noticed that on some bulbs an increase in signal strength would result. It is important, at this point, to realize that Armstrong is a remarkably clear thinker. His achievement was not the result of an accident, but the consummation of a thoughtful and imaginative mind. Step by step he proceeded with the study and experiment. He was obtaining what seemed to him remarkable results, and in December, 1912, he had succeeded in improving the sensitiveness of the audion by means of a new connection. The merit of the invention was soon recognized, and the very apparatus of which Armstrong was the inventor was subsequently utilized commercially at Sayville, Long Island, shortly after the outbreak of the war in 1914, to overcome difficulties in the reception of signals from Nauen, Germany."

When the United States entered the war, Armstrong, who was then working with Professor Pupin in the Hartley Research Laboratory, Columbia University, was commissioned as captain in the army and served in the Signal Corps, A. E. F., where he rose to the rank of major. The invention which by that time had become widely known, was used by the Signal Corps of all the armies in the field for receiving radio messages under the difficult conditions of warfare.

The commercial value of the invention was appreciated at an early date, and licenses were taken out by the Atlantic Communication Company, the Goldschmidt Company, and the Marconi Company during the years 1914 and 1916.

All radio amateurs are familiar with the circuit. It permits them to receive on a simple small antenna the radio signals transmitted from great distances. Thus it is possible for an amateur in and about New York with his antenna located on his apartment house and using the Armstrong feedback circuit to hear messages from Nauen, Honolulu, Darien, Norway, Philippine Islands, Lyons, and the great Lafayette Station installed by the Americans during the war at Bordeaux, France. It is also depended upon in the delicate work of direction finding which requires receiving instruments of the utmost delicacy. It was used on the NC Navy planes which crossed the Atlantic.

Professor M. I. Pupin of Columbia University says:

"Edwin H. Armstrong's contribution to the radio art is epoch making. No one who has employed his feedback can fail to appreciate its eminent value and inexhaustible possibilities. Armstrong made his invention when he was about twenty-one years of age and before he graduated in the Department of Electrical Engineering at Columbia University in 1913. The regenerative receiver and the regenerative oscillator will always figure among the classical inventions and will occupy a foremost position in the research laboratory, as well as in the commercial wireless service. It entitles Armstrong to a very high place among electrical inventors."

The principal defences urged by the DeForest Company and the American Telephone and Telegraph Company were prior inventions by Dr. DeForest, and that Armstrong's invention was of a very limited character. Judge Mayer held that Armstrong was the first inventor, and that the invention was of a very broad character, covering any feedback arrangement.

A Practical Handbook

Winston's Practical Handbook, price $3.00, is a book of necessary information arranged for ready reference. It consists of 1282 pages, fully illustrated, 1064 pages constitute a dictionary, which contains all of the words in the English language in ordinary use, and includes the many new words that have recently come into practice. The words are conveniently divided into syllables, in the manner employed by the best writers. The pronunciation of each word is shown by a clear and properly accented system of phonetic spelling. It also contains a dictionary of terms used in commerce and law, names of important places, persons, buildings, monuments, periods, etc.; also significant words and phrases frequently met with in literature; notable statistics of the world; facts worth knowing; business forms and laws; business letter writing; social letter writing; forms of address; Postal information and Helps to Correct English, besides a multitude of other valuable information. Address and make remittances to John B. Taltavall, Publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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The Annual Proceedings of the Old Timers' Toronto Reunion

The Printed Proceedings of the Thirty-seventh Annual Reunion of the Old Time Telegraphers' and Historical Association, which was held at the King Edward Hotel, Toronto, Ontario, on August 31st, September 1st and 2d, 1920, are now being distributed among the membership at large. The book consists of eighty-six coated paper pages and a cover and the workmanship is of the best. The book, which has been prepared under the skillful supervision of Thomas E. Fleming, secretary of the Association, will no doubt prove to be one of the best pieces of telegraph literature that the members have received in many years.

Among the numerous subjects taken care of are the following: Addresses by Charles Marriot of Toronto; J. S. McKinnon, Toronto; G. D. Robertson, Ottawa; L. B. McFarlane, Montreal; George D. Perry of Toronto; E. P. Griffith, Jersey City, N. J.; Lieutenant-Governor Clarke, Province of Ontario; Edwin Pope, Quebec; W. H. Canniff, Cleveland; D. B. Hanna, Toronto; Walter C. Burton, Brooklyn; Robert F. Easson, a forty-niner of the telegraph, Toronto; Thomas E. Fleming, and J. J. Ghegan of New York.

At the end of the book a complete list of the names of the members of the Association are printed, together with the Preamble, Constitution and By-Laws of the Association. A list of the previous reunions, together with the names of officers, are also given. The names of the living forty-niners of the telegraph are shown, together with a list of the names of the members of the Society of the United States Military Telegraph Corps.

Among the engravings are those of David Homer Bates, David Homer Bates, Jr., C. W. Bradley, Charles P. Bruch, Russell L. Bruch, A. E. Chandler, Hon. Thomas L. Church, Chas. E. Davies, W. J. Duckworth, Robert F. Easson, the Edison Message, Thomas E. Fleming, E. P. Griffith, D. B. Hanna, George Hogarth, Samuel E. Ingram, William L. Ives, A. C. McConnell, S. B. McMichael, Mrs. S. B. McMichael, J. McMillan, Richard O'Brien, George D. Perry, Mrs. George D. Perry, W. R. Plum, J. J. Seitz, J. B. Taltavall, Arthur Lincoln Tinker, George Watt and E. R. Wood.

The officers of the Association elected for 1921 were: C. W. Bradley, president, Richmond, Va.; vice-presidents, George W. Stevens, J. W. Crews and W. G. Sale, of Richmond, Va.; secretary and treasurer, Thomas E. Fleming, 195 Broadway, New York; Executive Committee, George D. Perry, Toronto, Ont.; Wm. H. Canniff, Cleveland; F. F. Fitzpatrick, New York; George M. Myers, Kansas City, Mo.; H. C. Worthen, Atlanta, Ga.; G. W. Jett, Roanoke, Va.; M. T. Spicer, T. R. Gooch and W. H. Stansell of Richmond, Va. Since the election, President C. W. Bradley and Vice-President George W. Stevens have died, and General Joe Lane Stern was elected president and E. P. Goodwin of Richmond, vice-president, at a meeting of members held in Richmond on March 24th.

Altogether the book is one that is in keeping with the high ideals of the Old Timers, and those who read the book will reach a speedy conclusion that the Toronto Reunion, under the masterly guidance of its president, George D. Perry, was one of the best every held.

Cable Connections in Mexico Needed

One of the most serious problems confronting the oil companies and business men of Tampico is the inadequateness of the telegraph service with the United States. Between three thousand and four thousand telegraphic messages are filed a day for transmission over the land lines by way of Laredo. The Tampico office is utterly unable to cope with such an immense amount of business, and even those messages marked "urgent"—which cost double the regular rate—take from three to five days, not hours—to reach the United States.

Thirteen miles off the port of Tampico the Galveston-Vera Cruz cable line passes, and it would be a comparatively simple matter to connect this with Tampico. The Federal land lines were sufficient to cope with the amount of business in the old days, but with the oil boom of recent years these lines are entirely insufficient to handle the amount of business that is increasing rather than decreasing. The officials of the Tampico Chamber of Commerce state that the business men of Tampico would be glad to pay to the Government the regular telegraph rates in addition to the cable tolls in order that the Government would lose no revenue if it permitted the Galveston cable to be linked up with Tampico. Eventually it would mean a large increase in revenue for the Government, as the Laredo line would always be a serious competitor with the cable and would always receive a large proportion of the business. With a better service there would be a large increase in the volume of business, which would mean increased Government revenues, so that the linking up of Tampico with the cable would be a good thing from every point of view.

Selenium a Rare Element

Selenium is a rare and little-used element described by the United States Geological Survey as having its greatest use in giving a red color to glass, such as that used on railroads for signal lights, and in coloring enameled ware red. It is also used to overcome the natural green color of ordinary glass. Selenium is peculiar in being a very poor conductor of electricity in the dark and a fairly good conductor in the light, and is used in several electrical devices whose utility depends on this peculiarity. It has been used in telephoning along a ray of light and in transmitting sounds and photographs from one place to another over a wire.

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY.

By Louis Casper.

Lesson 28

Electric Quantity

While electricity is a difficult word to define, we have as a starting point to assume that it is of such a nature as to be susceptible of possessing quantity. We have to use the conception of definite and definable quantities of electricity without being able to say what we mean by electricity itself.

The conception of an electric current is that of the transfer of quantities of electricity along a wire or conductor, just as in a current of water measured in gallons are transferred through a pipe.

An electric current operating a telegraph circuit, exciting electro-magnets or driving motors is familiar enough; but the idea of quantities stored up in receptacles is less conceivable. A quantity of electricity of a certain polarity may be stored upon the surface of any *insulated* body and the surface of such bodies seem to be the only part concerned

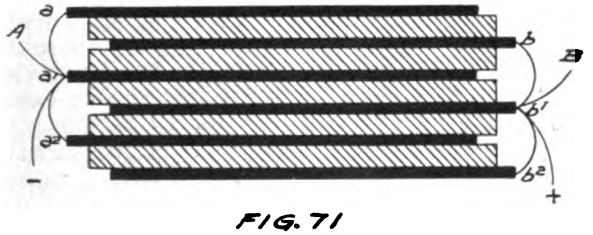

FIG. 71

in the storage of electricity. Coincident with such storage is the storage of another equal quantity of opposite polarity somewhere else. A quantity of electricity cannot be stored or charged upon a surface unless an equal and opposite charge is stored elsewhere.

Condensers

A typical arrangement of conductors capable of receiving a large charge of electricity relative to their size and number is known as a condenser. The capacity of a condenser varies with the surface of the conductors and the distance they are separated from each other. The larger the conducting surface and the closer together they are, the greater will be the capacity. They are, therefore, generally made up of thin metallic sheets, separated by the thinnest insulation that will withstand the electrical pressure to which the condenser will be subjected. The manner in which the sheets or plates of condensers are most generally arranged for telegraph and telephone use is shown in cross section in Fig. 71. This comprises two surfaces adapted to receive and conduct electricity insulated from each other. To enable the surfaces to conduct electricity to every part of their area and to give it up when wanted, are, as already intimated, made of metal. The electricity is not stored on the surface of the metal sheets as is sometimes erroneously supposed, but is, as stated, simply a means of conducting electric quantity that is stored on the *insulated* surfaces between the metallic sheets.

The insulation of condensers used in telegraph apparatus consists of a special grade of paper and the metallic conductors are of tin or lead foil. The sheets of tinfoil are piled up like the leaves of a book with paper between the leaves. Every leaf of tinfoil is kept in electric connection with the leaf of one set of leaves, there being two sets of leaves as shown by connections A and B in Fig. 71. The dark lines a, a^1, and a^2 represent one set of sheets of tin or lead foil, all connected together. The dark lines b, b^1 and b^2 represent the other set, also connected together. The shaded part intervening represents the dielectric, which may be paper, mica, or glass. In some condensers it is simply air and plates of metal being used instead of tinfoil. A and B are the conductors by which the condenser may be charged and discharged. One set of sheets will receive a positive (+) charge when the other receives the negative (—) charge, and vice versa.

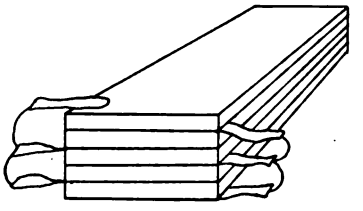

FIG 72

Fig. 72 shows the way a condenser is built up. It is enclosed in a box with binding posts for the two sets of leaves. Various modifications are used in telegraph practice whereby capacity may be cut in and out by means of metallic plugs or radial switches.

Capacity

Every electrical circuit possesses some capacity—that is, every circuit is capable of receiving and holding a charge of electricity. When two terminals of a circuit are connected to a source of electrical pressure, electricity begins to flow in the former. This flow of electricity or current continues until the circuit is fully charged, which is at the time when its counter e. m. f. is equal to the e. m. f. which produces it.

An analogy of the working of capacity in a circuit can be obtained by referring to Fig. 69, shown in the previous lesson. Again we have a cylinder C filled with water and fitted with a piston P, which is driven back and forth by some exterior mechanical force. At each end of the cylinder is a diaphragm made of resilient rubber. In order to study the action of the condenser or of capacity alone we will neglect for the time being the action of

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the heavy water wheel W, which was exemplified in the previous lesson. If the piston moves forward, the water in the cylinder begins to move forward also, and the rubber diaphragm begins to stretch to make room for it, as shown in the figure by the curved line to the right of the latter at D. By the time the piston has made the full length of its stroke forward, the diaphragm is fully stretched, and, as the piston begins its return stroke, the rubber immediately begins to force the water back after it. A certain amount of energy has been stored in the rubber diaphragm, and is now being returned to the piston or its prime mover, and as the piston recedes the diaphragm at the opposite end of the cylinder begins to stretch, thus storing energy, which is returned to the piston immediately as the latter recedes, but in the opposite direction from that of the previous movement of the piston.

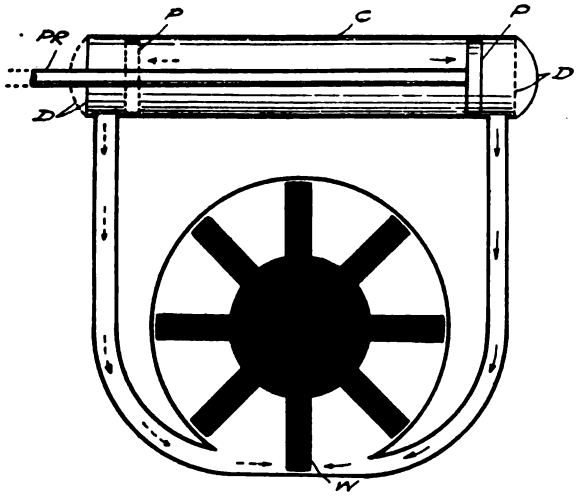

FIG. 69

From this it is apparent that the maximum movement of water occurs at the time of minimum pressure of the piston. If we follow the movement of the piston through one or more complete revolutions, we shall see that the greatest flow of water takes place at the time when the piston is in the middle of its stroke, and at this time the diaphragms at both ends of the cylinder are in their normal positions and offering no opposition whatever to the flow.

If we should suddenly start the piston at its normal speed from the center of the cylinder, there would be a maximum flow at once, but the pressure would not become a maximum until the piston had advanced to the end of its stroke. We may, therefore, say that the flow of water leads the piston pressure, and the same is true of the current in the case of a flow of electricity; and the current in the form of capacity is said to be a *leading* current.

If we consider the flow of electricity as affected by capacity we shall find it by applying the analogy just described. In Fig. 73, let the heavy lined curve represent the current flowing through a condenser. The current exists only to equalize the difference in pressure existing between the condenser and the source of supply. If we neglect resistance, the counter e. m. f. of the condenser and the impressed e. m. f. of the line will always be exactly equal, but opposed to each other.

The counter e. m. f. may, therefore, be represented by the broken line and the impressed e. m. f. by the light solid line.

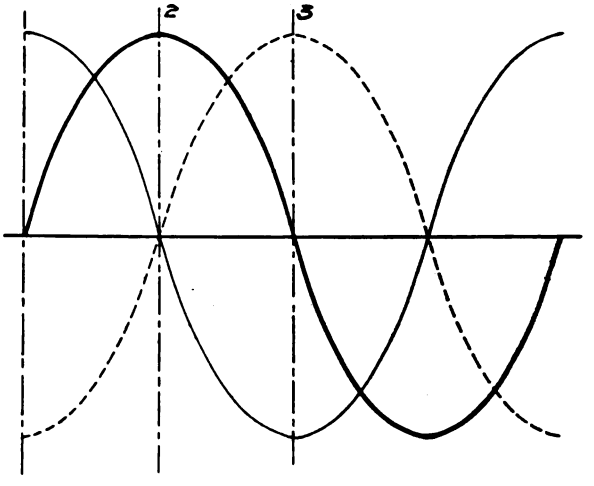

FIG. 73

The quantity of electricity flowing into a condenser is measured in coulombs (amperes times seconds), 10 amperes for one second produce exactly the same charge as 1 ampere for 10 seconds.

The capacity of a condenser is measured in farads; and a condenser is said to have a capacity of one farad when a charge of one coulomb produces a difference of potential of one volt between its plates. A condenser of one farad would, therefore, require a current of 160 amperes to be maintained for one second before attaining a difference of potential of 160 volts. The farad as a unit is too large for use in telegraph practice, condensers being rated in micro-farads or in fractions of the same. Long lines have considerable capacity and are often very troublesome. This phase will be taken up later.

Capacity in an electrical circuit reacts upon the impressed e. m. f. and this is spoken of as the capacity or condensive reactance. It is always directly opposed to the inductive reactance described in Lesson 27, and if of the proper value may neutralize the latter.

The condensive reactance of a condenser is found by the formula:

$$Xc = \frac{1}{2\pi fC}$$

where Xc = the condensive reactance in ohms; f = the frequency; π = 3.1416; and C = the capacity in farads (or micro-farads = .000001 farad).

It is obvious from this that the condensive reactance decreases with an increase in either frequency or capacity.

(To be Continued)

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Earth Boring Machine

Two officials of the Pacific Telephone and Telegraph Company, Motor Vehicle Department, San Francisco, Cal., have developed a very useful earth boring machine that seems to be accomplishing excellent work wherever used.

In 1914, when the first transcontinental telephone line was being constructed, there arose the necessity of an improved method of boring holes for poles.

A survey of the field for available machines was made, with the result that a power-driven auger mounted on the rear end of a horse-drawn wagon was purchased and put into use. This machine was powered by a four-cylinder gasoline engine, and required a team of four horses to draw it through the territory encountered. This method of locomotion was slow indeed, and difficulties were invariably experienced when holes were to be spotted.

The limitations of their machine were apparent to the officials, who set out to put their ideas into operation. The ideas were grouped together and detailed by them, and it was under their direction that the machine described hereafter achieved its phenomenal success.

The power-driven earth-boring machine is mounted on the front end of the chassis of a motor truck. Because of the fact that the pole line invariably extends "cross country," a truck having a four-wheel drive is absolutely essential to enable the truck to negotiate the surface encountered in plowed fields, irrigation ditches, and the like. The mounting of the boring machine is such that it is possible to bore a vertical hole with the truck on any negotiable grade; it is also possible to bore a hole at any angle up to forty-five degrees from the vertical with the truck on the level.

The earth-boring machine is driven through a universal shaft from the power take-off of the truck transmission. Since there are four speeds and a reverse in the truck transmission, the earth-boring machine may be driven at a wide range of speeds, thus adapting it for soils of different natures, such as adobe, clay, sand, hard-pan, etc.

In keeping with the idea for which the machine was primarily designed, a derrick with a movable boom is mounted on the truck bed "midship," to facilitate the setting of a pole in the hole. It may be mentioned here that the pole is set with cross-arms bolted in place, thus effecting a saving of time, as it is much more convenient to bolt the cross-arms in place while the pole is on the ground. The same advantage is to be gained in the case of guy wires.

The controls of the earth-boring machine and derrick are situated within easy reach of the truck driver, which obviates the necessity of changing his position to operate either the earth-boring machine and derrick, or of the necessity of having a separate operator for the operation of the earth-boring machine and derrick.

Since the left-hand drive on automobile trucks is almost universal in the United States, it is for this reason that the auger of the boring machine is placed on the left-hand side of the truck, where it is in plain view of the driver. The driver spots the point of auger on the surveyor's stage and sets the brakes on the truck, shifts the compound gear of the truck to neutral, and pulls in the clutch on the earth-boring machine. The auger is fed mechanically or by gravity. As soon as the auger buries itself, it is lifted by a second clutch until the lower side of the auger is clear of the ground. The auger is now turned in a clock-wise direction at a high rate of sped, thus throwing the soil by centrifugal force from the auger and clear of the hole. A hole six feet deep, twenty-two inches in diameter, can be bored on an average of seven minutes, considering all classes of soil.

An improvement on augers heretofore used is an earth-retaining gate developed by the officials. The difficulty experienced with the standard type of auger was that a considerable amount of earth would fall from it, when being raised from the hole.

The speed at which the auger is fed is, of course, dependent upon the nature of the soil. For hard-pan, the auger must be turned slowly to prevent the cutting edges of the auger from being burned. It may be said here that the cutting edges are replaceable, which fact lengthens the life of the auger. These cutting edges, two in number, are placed at an angle such as is found in a standard twist drill.

Another important feature which is incorporated in the auger gearing is that in case a hidden obstruction under the soil is struck, the auger feed is automatically and instantaneously reversed, thus raising the auger and precluding the possibility of any injury to the driving mechanism.

The truck being unaltered in any way by the application of the earth-boring machine to the chassis, it follows that in case the truck must be used for the purpose for which it was originally intended, it is possible to remove the boring machine within a few hours' time.

One of the objections to certain other earth-boring machines is the cost, but this boring machine may be built for a small fraction of the cost of other machines. The interest on the investment is also a factor to be considered, since the capital invested is small.

Upon first thought, one might believe that the weight of the earth-boring machine attachment is considerable, but such is not the case, as the total weight comes to about 1,800 pounds.

That the field of operation is limited to telephone and telegraph pole hole work is the wrong idea gained, but, on the other hand, the machine may be constructed to bore holes for fence posts, holes for planting trees or for any other class of work requiring a hole in mother earth. A track-laying tractor can be used in place of the motor truck when the latter's limit in locomotion is reached.

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EDITORIAL COMMENT

FEW have lived to see their discoveries put to such beneficent uses as Mme. Curie, the discoverer of radium, who is now in this country. It is no small item in the esteem in which Mme. Curie is held that she gave her discoveries to the world, exhibiting the finest spirit and living up to the best traditions of the medical profession. This will never be forgotten. It is the measure of the woman who is now receiving a royal welcome.

Pension Bill For the Relief of United States Military Telegraphers

In our issue of May 16th we stated that the Pension Bill of the United States Military Telegraph Corps had been reintroduced by Congressman McKenzie of Illinois.

The pension measure has been ordered reported favorably out of the Committee on Pensions, and it is expected soon to be acted upon by the House and later by the Senate. The measure has certainly got an early start, and it is confidently hoped that it will be acted upon favorably at this session of Congress. It is desired by those having the bill in charge that all interested, and friends of the measure, will write their Congressmen and Senators to expedite the final passage of this long-delayed pension bill.

The Articles on Automatic Telephony

Harry E. Hershey, the well-known telephone engineer of Chicago, is the author of the articles on "Automatic Telephony" which are now being printed in this publication. These articles are fulfilling a demand that is rapidly becoming pressing on account of the development of Automatic Telephony in supplanting the old systems, which are being rapidly displaced the world over. We are in receipt of many communications requesting that more details be given in these articles. Mr. Hershey, however, purposely omits certain details so that the reader will have to dig them out of the matter which is printed. These details are all covered in one form or another, but it will take the average man some time to find them.

There is no royal road to knowledge, and it is not Mr. Hershey's object to fill the student full of information, but rather to thoroughly ground him in the fundamentals, which will develop his reasoning power until finally he becomes, or does not become, a self-made man. This may be a cruel way of looking at the proposition, but so far it has developed some mighty good men. Mr. Hershey has had many years' experience in teaching Automatic Telephony, and he is an expert in this line of endeavor. His methods of preparing articles on Automatic Telephony may be regarded as the best for those who wish to make this important subject a study.

Loyalty

Where there is co-operation, there is Loyalty; where there is gratitude, there is Loyalty; where there is courtesy continually, there is Loyalty. If you are loyal you are successful. If you are working for your own advancement you are nothing but loyal, and if you are loyal to yourself you cannot help but be loyal to your employer.

To be loyal you must be interested in your particular line. If you are not interested you may as well get in line for a change, for you are not able to be loyal to either yourself or your employer. You may think you are devoting yourself to the company for the compensation they allow in return, but if you are not satisfied and entirely interested in your work you are not loyal to the company, neither are you doing justice to yourself.

Faith Is In Wireless for Long Distance Telephone

Signor Marconi, inventor of wireless, pins his faith to transatlantic telephonic communication by wireless instead of by cable, despite the recent successful experiments in America connecting Cuba with the mainland in a telephone circuit extending 5,000 miles.

"I still think," he said, "that the only satisfactory method of telephoning across the Atlantic is by wireless. At present we can only do a short distance by cable telephone—from London to Paris is as far as we can do now. In attempts to communicate with Spain we have failed. Up to 100 or 200 miles of cable it works. With 1,000 miles or more of cable it won't work.

"Wireless telephony, of course, has not yet been developed to the same extent as the wire telephone, but it is being rapidly improved. We have not done anything like 5,000 miles thus far. We have spoken successfully from London to Rome and we have got words through to America, but not in a commercial or practical way. At present there are certain disturbances of the waves in space, the cause of which has not yet been discovered."

F. A. MOHR, general manager, Western Union Telegraph Company, Dallas, Texas, in remitting to cover his subscription, writes: "It is always a pleasure to enclose my check for the renewal of the AGE, because I would be lonesome without its semi-monthly visits."

A Good Book For a Small Sum

Modern Land and Submarine Telegraphy, by Macomber, price 75 cents per copy, 6 inches by 8½ inches in length, fully illustrated. It is a ninety-page book and is devoted to a brief up-to-date treatise on the electric telegraph, including the development of modern methods and equipment.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

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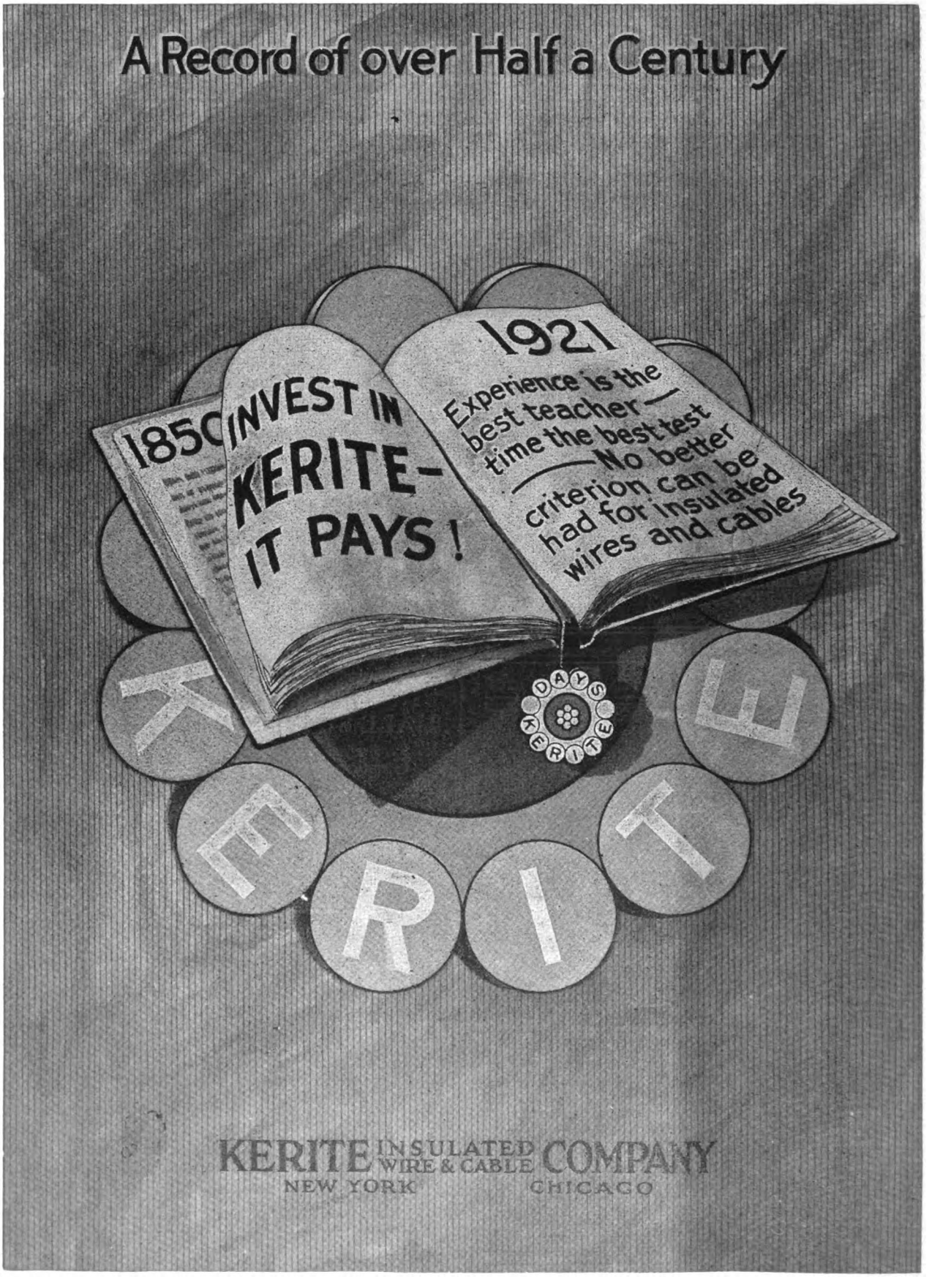

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THE RAILROAD

THE headquarters of F. H. Van Etten, superintendent of telegraph, Chicago, Terre Haute and Southeastern Railway Company, have been transferred from Chicago to Terre Haute, Ind.

O. C. GREENE, formerly and for many years superintendent of telegraph of the Northern Pacific Railroad Company, St. Paul, Minn., who retired from active service several years ago, and who has spent the winter on the Canal Zone, is now residing with his daughter at Moylan, Pa.

H. HULATT of Montreal; J. F. Caskey of South Bethlehem, Pa.; E. A. Chenery of St. Louis, and E. C. Keenan, New York, constituting a special committee, met in New York on May 26th to talk over matters pertaining to the Telegraph and Telephone Section of the American Railway Association.

COMMITTEE No. 11, Telephone Transmission, Telegraph and Telephone Section of the American Railway Association, met in New York in Secretary W. A. Fairbanks' office, on May 26th, to prepare its report for the September session at Cleveland, Ohio. The Committee is a new one, and the report will be preliminary in character. Stanley Rhoads is chairman of this committee.

Telegraph and Telephone Section of the American Railway Association—Specifications for Wire Crossings Over Railroads.

In 1913 the Association of Railway Telegraph Superintendents issued specifications for the construction and maintenance of telegraph, telephone and other similar wires crossing over railways, which specifications were approved by the American Telephone and Telegraph Company, Postal Telegraph-Cable Company, Western Union Telegraph Company, and other wire-using concerns, so that they have been generally considered the standard practice.

Recently the United States Bureau of Standards has issued rules covering electrical safety matters, which embrace the wire crossings. These rules are based upon engineering fundamental principles generally followed.

In order to conform to the Bureau of Standards' recommended rules, and to bring up to date the specifications adopted by the Association of Railway Telegraph Superintendents in 1913, the Telegraph and Telephone Section of the American Railway Association, Sub-Committee "B"—Wire Crossings, held a metting at New York on May 11th and 12th.

The following were in attendance: H. A. Shepard, chairman, New York, New Haven and Hartford Railroad, New Haven; G. A. Cellar, Pennsylvania System, Philadelphia; J. C. Rankine, Great Northern Railway, St. Paul; L. S. Wells, Long Island Railroad, New York; Stanley Rhoads, representing E. C. Keenan, New York Central Lines, New York; H. U. Lord, New York, New Haven and Hartford Railroad, New Haven; K. L. Wilkinson, F. E. Waters, and J. H. Moore, American Telephone and Telegraph Company, New York, and D. P. Dickie and C. P. Seidler, Western Union Telegraph Company, New York.

A draft of specifications previously gotten up by the chairman was submitted, and after a detailed discussion, corrections were made so that the committee will soon issue the specifications. These wire crossing specifications are very important in their relation to the safety of crossings over railroads. They embody considerable advance over the 1913 specifications in the strength provided in the crossing poles, wires, and guys, which strength requirements are based upon the recognized engineering fundamental principles, which take into consideration the proper assumed loading of ice and wind on the wires for the territory in which located. It is expected that the specifications will be issued as recommended practice after the September meeting of the Telegraph and Telephone Section, which is now scheduled to be held in Cleveland September 22rd, 23rd and 24th.

The American Telephone and Telegraph Company, the Western Union Telegraph Company, the Postal Telegraph-Cable Company, and the other wire-using companies who have co-operated with the Telegraph and Telephone Section in preparing these specifications, will adopt them, and the various State Commissions, it is thought, will also adopt them, so there will be one standard practice throughout the country, which would greatly simplify and advance the handling of such matters.

The members of Sub-Committee "B" have spent considerable time and hard work in preparing these specifications, which will reflect credit on the organization, as well as be greatly beneficial to the public, railroads and wire-using companies.

Death of Louis H. Korty

Louis H. Korty, aged seventy-five years, for about forty years superintendent of telegraph of the Union Pacific Railroad's System, died at Omaha, Neb., on May 16th, after a long illness Mr. Korty was born in Germany. His parents came to this country in 1850, and he learned telegraphy at Fort Madison, Iowa, when fourteen years of age. After holding many positions in different places in Iowa, Wisconsin and Illinois, he entered the United States Military Telegraph Service in 1863, and served during the Civil War in the Departments of the Cumberland, Tennessee, Mississippi, and the Gulf.

He was discharged from the Military Telegraph Service in Texas in 1867, and re-entered the Western Union Telegraph Company's employ at Chicago, where he was one of the three operators who worked the overland circuits.

In the spring of 1870 he entered the employ of the Union Pacific Railroad Company, serving as

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agent and telegraph manager at several stations in Wyoming and Utah. He was transferred to Omaha in October, 1871, as chief operator. He was later appointed assistant superintendent of telegraph, and on the resignation of J. J. Dickey as superintendent of the Union Pacific Lines, Mr. Korty succeeded him in that position in October, 1877.

Mr. Korty, in conjunction with the late Mr. Dickey, secured the telephone rights covering a portion of Iowa and all of Nebraska, Wyoming, Utah, Idaho and Montana, and under his indefatigable energy the telephone service in these States was developed.

In 1908 he resigned the superintendency of telegraph of the Union Pacific System on account of ill health, retiring from active service.

Mr. Korty was a member of the Loyal Legion, and was a Thirty-third Degree Mason, as well as a member of the Old Time Telegraphers' and Historical Association and the Telephone Pioneers of America.

He is survived by his wife and a daughter. The funeral services, which took place at his residence on May 18th, were attended by a large number of friends and former business associates.

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THE Proceedings of the American Railway Association, Telegraph and Telephone Section, annual session held at the Fort Pitt Hotel, Winnipeg, Man., September 22, 23, and 24, 1920, are just being issued. Considerable delay occurred on account of the strike of printers, binders, etc., in the vicinity of New York where the Proceedings were printed. The book has been gotten up in very nice typographical shape, being bound with cloth cover binding, which will give the volume, containing 379 pages, a permanent character, which will be appreciated by the telegraph and telephone superintendents and others who are now using this Association's standards as their regular practice. It is understood that on account of the trouble in the printing establishment some delay will still ensue. It is hoped, however, that the entire membership will receive their copies of the Proceedings within the next few weeks.

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Conference on Inductive Interference

A meeting was recently called in New York by agreement between the Public Policy Committee of the National Electric Light Association and the executives of the American Telephone and Telegraph Company for the formulation of a national policy on all inductive interference matters between the telephone companies controlled by the American Telephone and Telegraph Company and the electric light and power companies of the National Electric Light Association. By the formulation of such a policy it is hoped to eliminate inductive interference controversies and litigation, thus materially benefiting the public by permitting both industries to achieve the greatest possible development without unnecessary conflict.

It was agreed that every effort shall be made by both interests to arrive at a friendly solution of all present existing differences. Careful study of all existing statutes, commission rules and regulations and court decisions which govern the question of inductive interference in the several States of the Union is to be made by Charles Neave, of New York City, who was engaged for that purpose by the unanimous vote of the committee.

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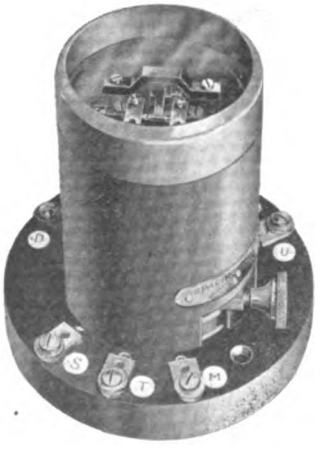
THE total number of telephones in service at December 31, 1920, in the United Kingdom was 998,500, and in the United States approximately 13,500,000. The ratio of telephones to population was one telephone to every forty-seven inhabitants in the United Kingdom, and one to every eight inhabitants in the United States. According to Sir W. Noble, engineer-in-chief to the Post Office, about £10,000 per annum is spent on telephone research work, but in America the telegraph and telephone companies spent £1,000,000 a year on such work.—*London Electrical Review.*



Wheatstone Type Polar Relay.

It is protected from dirt and moisture by a cover which totally encloses it, but which is readily removable.

The contact points are platinum.

It is particularly adapted to high speed operation with minimum current.

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The Use of a Spacing Wave in Continuous Wave Wireless Telegraphy

By E. H. SHAUGHNESSY, O.B.E., M.I.E.E., M.I.Rad.E.

From the London Post Office Electrical Engineers' Journal

In the early days of wireless telegraphy spark systems were invariably used, and despite their defects were the cause of commercially developing the art. The Marconi system, particularly in England, was greatly developed owing to the energies of those associated with Marconi. Spark systems for anything but ship and shore work are now, however, decadent. The defects of any spark system may be briefly summarized as follows: Firstly, that whatever the sparking rate, the aerial is only usefully employed for a proportion of the duration of a signal; and, secondly, as each spark discharge causes the aerial oscillations to grow from zero to a maximum and die away to zero, it produces impurity in the waves emitted. The rate at which this growth and fall takes place determines the impurity of the waves emitted and consequently the interference caused to other stations. In the case of Morse signalling at, say 100 words per minute, with a spark system having a sparking rate of 400 per second there would be approximately 4 or 5 sparks per dot.

Continuous wave generators are now well developed and are coming largely into use. No station for any fixed service would today be designed on any other method. The advantages of the method are that the aerial is utilized for the whole period of the signal, and except for the rise and fall of amplitude at the beginning and end of each signal the amplitude of the oscillations remains constant. Working continuous waves without a spacing wave at any speed produces an impurity disturbance equivalent to one spark train of once per dot and once per dash, but it will be seen when high speed continuous wave signalling is adopted that as the number of dots or dashes per second increases so the impurities emitted due to the rise and fall of amplitude of aerial current increase, and at 100 words per minute the equivalent of about 80 sparks per second is produced. When dealing with large stations having 200 amperes in the aerial, the amount of disturbance created may, therefore, be considerable.

The first practical means of working continuous wave telegraphy was by the Poulsen Arc, and it is well known that for satisfactory working the arc must be kept burning under almost constant conditions during the intervals between signal periods. The early method of doing this was to keep the arc oscillating on the aerial during the spacing period at a frequency slightly different from the marking frequency—that is, sending out a spacing wave—and to short-circuit a small portion of the aerial inductance to alter the wave length for producing marks at the appropriate station, the spacing and marking waves differing from each other by as much as 3 to 4 per cent. This was naturally considered a disadvantage, as such a transmitting station used too many wave lengths. To overcome this defect a method of throwing the arc load on to a non-radiating compensation circuit instead of the aerial during the spacing period was developed. While this was justified, as it avoided the use of a large band of waves permanently, and for key speeds was better than spark systems, yet it involves the building up of oscillations in the aerial from zero each time a signal is made.

During the past five years there have beeen great developments in large power arcs. No large power arc is worked on the compensation circuit method, but all use the spacing wave. The use of a spacing wave has many opponents, but it is suggested that what was considered a vice is indeed, with modern refinements, a virtue. If an arc is producing a current of 200 oscillating amperes in an aerial, the energy swings twice in each oscillation to a static charge on the aerial, the amplitude remaining constant. Now, if the inductance of the aerial be slightly altered, so as to make the wave length or frequency of the oscillation circuit slightly different, the new rate of oscillation occurs practically without change of amplitude and the disturbance created should be negligible as compared with that produced when the aerial energy is either sharply applied or sharply dissipated, as is done in the case when a spacing wave is not used. Unless, however, the percentage difference previously mentioned were very considerably reduced it is doubtful whether this advantage of a spacing wave would justify its use. The development of large power arcs, however, produced difficulties in keying, and in order to reduce these difficulties smaller differences in the oscillation frequencies of the marking and spacing waves were adopted. This called for more selective receiving apparatus, and today we find 200 kilowatt arcs, working with a difference of only .8 per cent. in the marking and spacing wave length with waves of the order of 15,000 meters, and being received satisfactorily 3,000 miles away. It should be noted that if the spacing wave is only .8 per cent. different from the marking wave, the marking wave cannot stray very far from its own normal value without producing bad signals at the distant receiving station. For high speed working the use of a spacing wave close to the marking wave appears to be desirable for signalling on all systems of continuous waves. Moreover, as in changing from a spacing to a marking wave, the transmitted signal commences immediately with full amplitude on the aerial, the time taken to build up the required amplitude at the receiving station is reduced, so tending to higher speeds. Engineers used to land line system will observe that the use of a marking and spacing wave preserves all the characteristics of double-current working, and will readily realize that these can be utilized in wireless working to produce higher speeds and multiple methods of working. It almost seems that if the spacing wave had not originally been used, today

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someone would be inventing it.

The disadvantage of consuming more power may be much more than outweighed by the possibility of crowding more stations into the total available zones of wave lengths and the higher speeds obtainable, especially as the fuel bill is by no means the largest item in the running of large wireless stations.

The ill effects of not using a spacing wave for high speed continuous wave signalling are very clearly shown in a paper by Dr. E. F. W. Alexanderson, in the Proceedings of the Institute of Radio Engineers, Vol. 8, No. 4, Aug., 1920.

Thomas H. Brooke, Sixty-two Years in the Service

Sixty-two years of dots and dashes—and still making 'em.

That's the record of Thomas H. Brooke, Civil War veteran, now handling an average of fifty messages daily in the Anadarko, Okla., Western Union Telegraph office. And although Mr. Brooke is seven years past the iron-clad Western Union retirement age, he's still in the company's service, and he doesn't use a "bug" or "mill," but pounds out every message with his hand or receives in longhand.

Born in Preston County, Virginia, in 1844, Thomas H. Brooke was operating a telegraph key when fifteen years of age, at Mannington, W. Va. Operators were few and far between in the before-the-war days, for Congress had only granted Samuel F. B. Morse means to construct the experimental line between Washington and Baltimore a few years previously.

After operating at various stations in Maryland and Virginia, Mr. Brooke went to Chicago. In 1863 he began his work as an army operator. Civilian operators were inducted into the service, issued uniforms and given the pay of the regulars, and were under strict army regulations, but were not a part of the forces of the United States.

While operating a combined army-railroad station at Fosterville, Tenn., Mr. Brooke was captured by troopers of the Fourteenth Texas Cavalry. Later he was paroled and returned to his home as a civilian operator, but he tired of routine telegraphing minus the excitement of fighting, and returned to the army, this time in civilian clothes.

Just before the war closed he was transferred to Washington, D. C., where he handled army orders, and where he remained during the grand review of the army by the President, and was still on duty when President Lincoln was assassinated.

With the close of the war activities Mr. Brooke crossed the plains in 1865 to Colorado, where for one year he became a prospector. "I saw more buffaloes on the plains in one herd than I've ever seen range cattle since," he said.

But the call of the key and sounder was too strong, so Mr. Brooke returned to Virginia and married, taking his bride west to Puicy Station, Wyoming, where he settled as agent for the Union Pacific Railroad, which had not yet been built across the mountains.

Again he left the key for a year and tried his hand at farming in Nebraska, and again the key called so persistently that when the Burlington first started to build from Pottsmouth, Neb., he was handling construction orders. He remained with the Burlington as a railroad operator twenty-five years, having been with the road even before the general manager was selected.

When Oklahoma Territory was first opened for settlement in 1889 Mr. Brooke left the Burlington and moved to Pond Creek as operator and station agent. He followed the rail head south as far as El Reno, opening every new station between Pond Creek and El Reno. When he reached Fort Reno he remained as agent operator for five years.

Business opportunities at Yukon were promising along the Choctaw Railroad, and he opened a furniture store for two years. When the Kiowa-Comanche country opened in 1901 Mr. Brooke moved to Anadarko and opened another furniture store, but shortly after he had established the business the entire block, including the post office, was destroyed by fire, and Mr. Brooke was left without a business, as he lost everything in the fire.

He went to Fort Cobb, twelve miles west of Anadarko, as station agent for a time, then was transferred to Perry, and in 1907 was sent back to Anadarko and placed in charge of the Western Union office.

In 1914 he passed the seventy-year mark. Western Union rules are that no operator more than seventy years old may work for that company. Anadarko citizens knew of this rule and circulated a petition among business and professional men requesting that this rule be suspended in Mr. Brooke's case.

The petition finally found its way to the New York office of the company, where an old friend of Mr. Brooke's had influence. After some delay Mr. Brooke was notified that for one year he would be permitted to remain as the Anadarko operator. At the end of the first year he was extended another year of operating, and for seven years now the company has continued to extend his service for another year.

So, although seventy-seven years of age, and an operator of sixty-two years' experience, Thomas H. Brooke is still "sitting in" eight hours daily, and when his call comes clicking in he's ready to work.

New Radio Call Book

The Consolidated Radio Call Book is now in stock and ready for distribution.

This book contains the calls for shore radio stations, ship stations, amateur stations, radio compass stations, etc. It also contains data on radio press schedules, weather reports and time schedules.

The price of the book is $1.25.

Order from Telegraph and Telephone Age, 253 Broadway, New York.

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Jimmy, Mascot of Messenger Boys, Laid to Rest in Grave Under Elm Tree

Buried in White Casket With Gold Name Plate—Floral Offerings Evidence of Unprecedented Tribute to Dog That Was Everybody's Friend.

In a snow-white, ivory trimmed casket, under huge wreaths and bouquets of flowers and with all the reverent ceremony that youthful minds could plan or youthful hands could execute, Jimmie, the collie mascot of Syracuse, N. Y., messenger boys, was buried May 17th.

His funeral was an event without precedent in the city's history—a remarkable tribute of human love for a canine friend.

Jimmie died May 16th in the Pendergast animal hospital in West Willow Street, Syracuse, victim of a complication of diseases developed by his devotion to duty. Six years of "messenger service," racing through the streets in all kinds of weather with his friends, the messenger boys, broke down his strength to the point where resistance was lacking. He had the best care and medical attention that money could buy—but it was all unavailing.

Until Jimmie was dead he was just a dog—known to sight by thousands of frequenters of the downtown district, but on terms of real friendship only with the boys of the messenger service. Dead, he became a personage, and from all sides came evidence of sympathy and desire to participate in a tribute to his memory.

The John Marsellus Casket Company made a little casket, just big enough for Jimmie, of the best materials in its shop.

C. B. Hendrickson, a jeweler, made a gold name plate and sent it over to be affixed to the casket.

John Conley, who owns a farm off East Brighton Avenue beyond the city line, set apart a tiny burial ground under a big elm in one corner of his best field, and offered it to the committee in charge of funeral arrangements.

A wealthy woman who lives at one of the local hotels ordered a big wreath of flowers and sent it to be draped over the casket.

The Western Union and Postal boys, who fought over Jimmie in life, dropped the feud and conceded common ownership of him in death, contributing to funds for the purchase of flowers and selecting a joint committee to have charge of funeral arrangements.

And from a dozen places, when the need became known, came offers of trucks and passenger cars for the funeral cortege.

It was all arranged, and at 5 o'clock on the day of the funeral the telegraph offices abandoned everything but emergency business and went to the funeral. The company officials, the office staffs, the pall bearers and a few outsiders rode in the contributed machines; the boys rode their bicycles. The body of Jimmie rode ahead on an inclosed truck.

The procession started at the Pendergast hospital and moved rapidly out to the Conley farm. A delegation of messengers had prepared the grave; there was no effort at a burial service and the interment took only a few moments. The casket was removed from the truck, while the crowd stood with bared heads, and lowered into the ground under a thick canopy of flowers. James W. Weed, city manager for the Postal, and Edward A. Baird, city superintendent for the Western Union, threw in the first shovelfuls of earth, and the boys did the rest.

The pallbearers were four of Jimmie's oldest friends—Thomas King and James McDougal of the Postal force, and Edward Poulsen and William Schaffer, representing the Western Union. "King" Kelley, the one-time boss of the newsboys, who claims to be the original Syracuse owner of Jimmie, was master of ceremonies.

The newspaper and movie photographers bustled about, recording for posterity the most elaborate funeral a Syracuse dog ever had, but there was no absurdity or unfitness about it for the messenger boys. To them it was a sincere tribute to a friend they loved—a friend whose devotion had often been tested and upon whom experience had taught them to rely. There was more than one of them that had trouble in seeing clearly, and more than one of the office girls who found handkerchiefs handy.

Joyous, genial Jimmie is now only a memory—but a memory that will last for a long, long time.

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Herbert's Book on Telegraphy

The Fourth Edition of Herbert's "Telegraphy" was placed on the market in December. The price of this enlarged book of 1,020 pages is $6.50 per copy. This work is a detailed exposition of the telegraph system of the British Government, and has been thoroughly revised as well as enlarged. It not only describes the English telegraph systems, but other systems which are of direct interest to American practice.

The chapter on Secondary Cells or Storage Batteries has been extended and brought up to date. A description of the Kleinschmidt Perforator is also found in this book.

Appendix C on the Gulstad Relay has been rewritten in view of the adoption of this relay on so many long and difficult circuits.

In the Addendum following the Appendix there is an elementary account of the amplifying wave.

The use of small currents to enable telegraph and telephone circuits to be worked in the same cable has far-reaching consequence in the English telegraph practice, and it is fully covered.

A chapter is also devoted to the Vibroplex. Experiments are being made to ascertain whether its adoption lessens the strain on the telegrapher, reduces the liability to "cramp," and increases the output of work.

Those desiring copies of this valuable book should address and make remittances to John B. Taltavall, Publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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PERSONAL

WALTER C. HUMSTONE, formerly and for many years superintendent of the Western Union Telegraph Company, New York, now retired from active service, will spend the summer months, as has been his custom for many years, at Pittsfield, Mass.

M. RUBERG of the American Telephone and Telegraph Company, Philadelphia, Pa., has gone to Havana, Cuba, for Cuban-American interests, and may remain in that country permanently.

W. L. JONES, president and general manager of the Postal Telegraph-Cable Company of Texas, Dallas, Texas, was a New York business visitor on May 19th, in connection with matters looking to the dissolution of his company, which will be effective on June 1st.

E. E. HUDSON, well known in telegraph and electrical circles, has been elected president of the Waterbury Battery Company, vice Charles B. Schoenmehl, deceased.

POSTAL TELEGRAPH-CABLE COMPANY

Death of Isaac Smith

Isaac Smith, superintendent of tariffs, New York, was stricken with apoplexy after returning to his office from dinner on May 24th. He was removed to his home at Forest Hill, N. J., where he died on May 26th, without having regained consciousness.

Mr. Smith was born in Brooklyn, N. Y., on May 10, 1859. He became an operator for the Bankers and Merchants Telegraph Company in 1880, and in 1884 entered the service of the Postal Telegraph-Cable Company, being connected with the Auditor's and Tariff Departments until December, 1892, when he was appointed superintendent of tariffs, which position he held until the time of his death.

Two No. 9 copper wires will be strung and will follow the route of the Columbia River highway, entailing an investment of approximately $50,000. The new wires will be used for telegraph and also for long-distance telephone service, giving Astoria direct connection with Portland, Eugene, Medford, Ashland, Yakima, Tacoma, Seattle and Spokane.

E. W. COLLINS, general superintendent, and Superintendents Blake and Thomas have visited many offices in the Western Division of late in the interest of the service. All of these officials speak well of the outlook for the future.

C. M. BAKER, general superintendent of plant, Chicago, has recently made trips of inspection through many of the Middle Western States.

J. J. WHALEN, traffic manager, is back at his desk looking genial, hale and hearty, notwithstanding his six weeks' enforced absence, as a result of the bad after-effects of a slight operation.

E. P. TULLY, assistant to the general manager, is on a visit to Chicago and other Western points in the interest of the service.

F. J. KERNAN, auditor, is again confined to his home by illness.

TRAVELING AUDITOR H. W. HETZEL has returned to New York after considerable time spent in the West and on the Pacific Coast.

C. J. MOORE, who for the past six months has been attached to the office of Chief Engineer J. F. Skirrow, has been transferred to Buffalo as district foreman, vice L. H. Bangert.

L. H. BANGERT, district foreman, Buffalo, N. Y., died on May 9th. Mr. Bangert had been connected with this company since 1893. He was a very capable employee, a man of even temperament and well liked by all with whom he had dealings.

NAT BARTON, foreman, died of typhoid pneumonia in Buffalo, N. Y., May 9th. Mr. Barton entered the company's service in 1901. He was a very efficient foreman and very fit in right-of-way matters.

Managers Appointed

J. J. Bishop, Daytona, Fla.; Miss Nola Wilson, Millen, Ga.; Miss M. Cleland, Port Huron, Mich.; A. C. McDonald, Idaho Falls, Idaho; M. Hart, Hudson, New York; Geo. H. Cassen, St. Paul, Minn.; W. C. Bruchman, Duluth, Minn.; H. L. Barksdale, Fayetteville, N. C.; T. S. McDonald, Rock Hill, S. C., and J. A. Crawford, Suffolk, Va.

ELMER H. LOCKE, aged fifty-three years, assistant traffic chief of the Philadelphia main office, died May 24th, after a long illness. Mr. Locke was a native of Philadelphia, and entered the telegraph service for the American District Telegraph Company, transferring to this company in the middle nineties. He was night chief operator of this office from 1908 to 1914, when he was appointed assistant traffic chief, which position he occupied until the time of his death.

RALPH G. CARR, formerly of the New York main office, who transferred to the San Francisco office some time ago, is now general traffic chief of the main office at that point.

Commercial Cable Company

JOHN GOLDHAMMER of the Executive Offices, New York, sailed for Europe on May 14th and will be absent several weeks.

THE repair and diversion of the Guam-Manila cable, interrupted April 23rd in the San Bernandino Straits, is completed.

THE Cable steamer *Pacific* is now on her way to Manila to take out a fault located near the shore landing. With this fault removed, which is a small job, the Pacific cable service to the Philippines and China will be resumed.

J. D. GAINES, superintendent of the Commercial

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Pacific Company, Shanghai, China, has retired on pension and has returned to New York, accompanied by his wife. Mr. Gaines is the son of a former United States Consul at Tripoli, where he was born. When Mr. Gaines was still a boy, his father relinquished his position as Consul at Tripoli, and, becoming associated with telegraphy, assisted in laying the first Atlantic cable to America. Mr. Gaines learned telegraphy with the Anglo-American Cable Company at Duxbury, Mass., where he remained from 1874 to 1884, when he joined the Commercial Cable Company's force at Canso, N. S. Here he remained until 1902, when he joined the Commercial Pacific Cable Company's staff at Honolulu. In 1909 he was transferred to Shanghai, China, as superintendent, at which point he remained until his retirement.

WESTERN UNION TELEGRAPH CO.

W. N. FASHBAUGH, vice-president in charge of traffic, is in Denver, Colo., for the benefit of his health. It is expected that he will remain there for some time.

A. G. Williams, Sr., who a few days ago was retired as a member of the Central Cable Office staff, has had an eventful career of fifty-eight years in the cable service in England, Egypt, Newfoundland and New York.

He first joined the British Indian Submarine Company, amalgamated in the Eastern Submarine Company, and assisted in the laying of the Suez-Aden Cable, and sent and received the first paid messages through from England to India. He was transferred to the Anglo-American Cable Company in 1873, arriving in Hearts Content, Newfoundland, in the *Great Eastern,* which laid the 1873 cable during her voyage.

Mr. Williams was one of the first operators to use the recorder, which supplanted the Mirror System. He joined the Western Union Telegraph Company in 1899, with a break in service of four years in the Postal Telegraph-Cable Company.

This long record from 1863 to 1921 in telegraphy from Morse and Needle Systems to Mirror, Recorder and Automatic, is probably one of the longest records in cable telegraphy.

Eastern Division

MISS M. L. CORBETT has been appointed cashier at Troy, N. Y., vice Miss K. G. Bowe, resigned to be married.

MISS BEATRICE R. HERRICK of the general operating department, New York City, has been appointed manager at Raquette Lake, N. Y., for the summer.

MISS LULU FARNSWORTH of Herkimer, N. Y., has been assigned to the management at Chautauqua, N. Y., for the summer season.

MANAGERS APPOINTED: A. A. Nourie, Ansonia, Conn.; Carl Moss, Danbury, Conn.; Agnes Emmett, Derby, Conn.; J. J. Moriarty, Vineland, N. J., and Wm. Kleinschmidt, Newark, Del.

T. E. RUSSELL has been appointed office supervisor in District Commercial Superintendent F. R. Veale's office, New York.

F. S. LEWIS has returned to duty in Superintendent W. A. Sawyer's office, New York.

A. J. HOLLAND, who has been manager of the Oil City, Pa., office since 1889, developing from a messenger boy in that office, died on May 19th. His was a record of diligence and faithfulness to every interest of the Company.

W. F. CLARK, assistant manager, Wheeling, W. Va., has been promoted to the managership at Oil City, Pa., vice J. C. Calahan, resigned to enter other business.

ROBERT MCCARTHY, aged fifty-two years, a well-known telegraph operator, died in Philadelphia on May 18th. He had been in the service of the Western Union Telegraph Company in the Quaker City for thirty-nine years, including fifteen years as manager of the telegraph department of the *Public Ledger*. Mr. McCarthy is survived by his wife, three daughters and three sons.

J. G. MCNERNY of the Buffalo force has been laid up for some time past with a broken wrist and fractured hip, caused by a twenty-foot fall to the sidewalk while examining a cable in one of the buildings. Mr. McNerny lost his grip while descending a fire escape. He will probably return to duty on June 1st.

Lake Division

WE are in receipt of a group photograph of the Indianapolis, Ind., bicycle messenger force. The photograph shows upward of forty handsome-looking messenger boys in uniform and standing alongside of their bicycles. The apparent discipline of the messengers proves that a careful selection of good messenger material is made in the Hoosier State.

OSCAR BOEHNE, assistant chief operator in charge of automatics, St. Louis, Mo., sailed from New York a few days ago on the steamer *United States* for Copenhagen, Denmark. He will visit Norway, Sweden, Germany, France, Holland and England before his return.

Canadian National Telegraphs

EWAN CAMERON, aged eighty-two years, for fifty years in charge of the Great North Western Telegraph Office at Brantford, Ontario, in his day one of the best telegraphers and connected with the transmission of the first telephone message over a telegraph wire, which took place between Brantford and Paris, with Alexander Graham Bell conducting the experiments, died on May 13th. His association with fraternal organizations, and a very large circle of friends, will be greatly missed.

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Radio Corporation of America

SUPERINTENDENT BARSBY of the High Power Station at Belmar, N. J., is recovering from a severe illness, which has confined him to his bed for several weeks.

THE New Jersey Society of the Sons of the Revolution held their annual meeting recently at Tuckerton, N. J., and paid a visit of inspection to the High Power Station there.

TRAFFIC MANAGER W. A. WINTERBOTTOM, New York, was last heard from at the High Power Station at Towyn, Wales.

Radio Aurora Proof

E. J. Nally, president of the Radio Corporation of America, New York, under date of May 20th, had the following to say in one of the New York newspapers:

In view of the reports which have been published recently concerning the numerous unusual effects, and in some instances severe damage, occurring to telegraph, telephone and cable lines, caused by the aurora borealis, you may be interested to know that these disturbances did not in any way affect radio communication proper.

The engineers of the Radio Corporation of America were well pleased with the behavior of radio during the powerful magnetic disturbances on May 7th and 8th, which accompanied the aurora borealis and which were followed by the breaking out of a large cluster of spots on the sun. They reported no noticeable change in the transmission and reception of the powerful radio waves, which are constantly being exchanged between the United States and Europe and Asia.

In this connection it is interesting to note that our experience of the last few days is parallel to that of the French radio service, for we were informed that the Bordeaux radio station seemed relatively immune from the dangerous ground currents which have so seriously affected wire communication.

It has been known for some time that disturbances similar to those produced by the aurora borealis would not affect radio, and we were glad to have the opportunity to confirm this theory. Indeed, we have graphic record of this fact, for our high-speed records of radio signals taken throughout the presence of the disturbances show not the slightest trace of the aurora borealis.

Inter City Radio Company Seeking to Enjoin United States

An injunction suit was filed in the United States District Court, New York, a few days ago by the Inter City Radio Company, Inc., against Herbert Hoover, Secretary of Commerce, and twenty other members of the Department of Commerce, asking the court to enjoin the Government from revoking its license. The radio company is a commercial enterprise, with a plant at 110 West Fortieth Street, the World Tower Building, and offices in the Park Row Building, New York.

Francis G. Caffey, United States Attorney, declared that the petitioning company pursued methods of operation that were not satisfactory to the Government. It is alleged, he said, that the operations of the radio company interfere with radio messages between United States Shipping Board vessels, and in several cases has interfered with the movements of warships.

All America Cables

P. MAC G. PARKER of the electrical department sailed from New York for England a few days ago to study the manufacturing of deep sea cables.

CAPTAIN G. W. BICHNELL, Captain J. R. Sheehan, Lieutenant G. W. Lewis, Massey, S. K. Babcock have recently joined the company's service.

E. F. CUMMINGS of Vice-President McLaren's office has returned to New York after a six weeks' visit to Tampico and Mexico City on company business.

THE company's new cable between the United States and Porto Rico will be laid the latter part of June.

THIS company has announced the extension of deferred rate cable service to the following Central American Republics: Guatemala, Salvador, Honduras and Nicaragua. The tariff is one-half the regular rate.

B. H. REYNOLDS, superintendent, New York, has returned from Cleveland, where he attended the National Foreign Trade Convention as a trade adviser on telegraph communications between North, South and Central America.

CAPTAIN EDGAR OLDHAM returned to New York on the steamer *Relay* after extended cable operations in Central American waters.

OTTO STRUBEL, formerly electrician of the company, now retired, fractured his ankle a short time ago while getting off a car and is now confined to his home. He is progressing favorably.

JAMES G. BARTLETT, aged forty-nine years, senior operator in the service at New York, born in Hearts Content, N. F., son of James Bartlett, one of the original staff of the Anglo-American Telegraph Company at that point, died of a stroke of apoplexy on April 15th. He had been in the service of this company since 1889. He is survived by his wife and eight children, two of whom are in the company's service.

W. H. H. KING, operator at Barranco, died on April 28th of heart disease.

IN accordance with the All America Cable pension and death and disability benefits, the widows of both of the dead employees will be paid two years' salary.

IN a plaza near a telephone office there is a statue of Columbus with the date 1492 inscribed thereon, and those who do not know better regard this as his telephone number.

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CONTENTS

Carrier Current Telephony and Telegraphy. By E. H. Colpitts and O. B. Blackwell. (Continued from page 244, June 1st issue) 266

The Side Switchless Connector. By Harry E. Hershey. (Continued from page 246, June 1st issue) 268

The Task of the Telephone. Extracts from an Address by B. E. Sunny. 270

Increasing the Liabilities of Telegraph Companies 272

The Recent Electrical Disturbances. Notes on Observations of Aurora or Earth Current Effect on Telegraph Wires at Capreol, May 14th. 273

History of the Morse Statue in Central Park. By John Horn. (Continued from page 248, June 1st issue) 274

Student's Course in Technical Telegraphy. By Louis Casper. Lesson 29 276

The Variation of Radio Signals 277

Editorial—Considers New Cable Law. The Telegraph and Telephone in China. Loanable Funds Inadequate 278

The Railroad—Telegraph and Telephone Section of the American Railway Association. Railroad Wire Systems Rank High 281

Columbia Dry Batteries Drop in Price. Death of Karl G. Roebling. Colonel Roebling Heads Company at Eighty-four. Telegraph and Telephone Life Insurance Association. Old Time Telegraphers' and Historical Association 282

A Problem in Electrical Engineering to the Editor of Telegraph and Telephone Age 283

Personal. Postal Telegraph-Cable Company 284

Western Union Telegraph Company 285

Radio Corporation of America. All America Cables. Canadian National Telegraphs 287

"Rough It" in Canada! Wireless Concert Pleases. Telephone Dividend Increased 288

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Carrier Current Telephony and Telegraphy

By E. H. Colpitts and O. B. Blackwell

(Continued in part from page 244, June 1st Issue)

In case of multiplex carrier telegraph operation, the non-essential frequency components are accordingly suppressed by the selective sending-circuits, so as to prevent them from interfering with other channels.

It will be seen that the transmission of the high-frequency current is controlled by a relay whose winding is included in the low-frequency line and the contacts of which short-circuit during the spacing intervals the output circuit of the oscillator which supplies energy to the line through an amplifier. At the receiving terminal the arrangement for demodulation or detection requires some further explanation. The carrier current, after suitable amplification, is applied to the input circuit of a vacuum-tube detector. The grid of this tube is made just sufficiently negative to prevent the flow of current in the plate circuit, which includes the winding of a relay, when no high-frequency current is being received from the line through the amplifier. During the marking intervals a high-frequency alternating potential is applied to the grid, causing a high-frequency pulsating current to flow in the plate-circuit and operate the relay which is adjusted so as to be held in the operated position for the duration of the signal. The contacts of this relay control the sending of signals over the connecting telegraph circuit.

Referring to the question of multiplex operation it may be mentioned that where the carrier frequency difference in frequency between the extreme edges of the side band is so small, that it is not so readily possible to design circuits to suppress one of the side bands, as can be done in the case of telephony. For this reason, the frequency range assigned to a carrier telegraph channel has been twice that of the essential frequency-range of the direct-current telegraph channel. As is obvious from previous consideration, the advantages of band filters largely disappear for narrow transmission bands at high frequencies, and in telegraphy it has been found more convenient, for the signaling speed so far met with, to use loosely coupled resonant circuits.

A frequent condition of two-way operation involves what in ordinary telegraphy, working, is termed "full duplex operation," where the oppositely directed channels are used simultaneously for independent messages. In ordinary telegraphy this full-duplex operation is secured by balanced bridge arrangements which involve at each terminal a close balancing of the actual line by an artificial line. This close balancing at low frequencies is secured by rather close attention of a repeater operator and rather frequent readjustments of the artificial line constant. While it is possible to adapt such an arrangement to the carrier telegraph line, it has not been found economical to do so because of the ease of securing full-duplex operation by the use of different carrier frequencies for the two directions. The extension of this method to multiplex operation is obvious. A very convenient frequency arrangement for carrier telegraphy has been found to be that in which transmissions in one direction occupy a range of frequency from 3300 to 6000 cycles, and those in the other direction from very slightly above 6000 to 10,000 cycles. By proper terminal arrangements this will provide on a single pair of wires the equivalent of ten full-duplex telegraph channels. From what has been said, it will appear that there is left still available a substantial frequency range which may, if desired, be used to provide, either other telegraph channels, or, if the needs of the service require them, additional telephone channels.

Frequency Assignments. From the statements regarding filters and the methods of obtaining two-way operation, it will be evident that it is possible to select the frequencies for the various telephone and telegraph channels in a variety of ways. What assignment of frequencies to the various channels is best suited to a particular installation depends upon the engineering and economic considerations involved. For example, where there is only a single pair of wires available and it is desired to secure over this pair as many carrier telephone channels as possible, it may be economical to go to considerable expense in securing sufficient uniformity in the line so that its impedance can be readily balanced by the artificial line networks, thereby making it possible to use the same range of frequency for securing a two-way telephone channel. The harmonic frequency arrangement already described is particularly useful in such a case.

If, however, it is desired to operate carrier systems over a number of pairs of wires on the same lead, considerations of cross-talk, which will be explained more fully later in a section dealing with lines, make it highly desirable that different frequencies be used for operation in the two directions. Under this conidtion it is not necessary to secure the uniformity of line impedance which is required when the same frequency is employed in both directions. Of the possible frequency assignments for the oppositely directed channels, one which has proved very convenient is that in which all of the channels in one direction employ carrier frequencies below a certain value, and all the channels in the opposite direction carrier frequencies above this value. This grouped arrangement simplifies the selective circuits both at the repeater points and at the terminals; for the separation between oppositely directed currents which is accomplished by the balancing of the high-frequency line when the same frequencies are used in both directions may, with this grouped arrangement, be accomplished by a combination of high and low pass filters. Above there are given, one above the

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other, the idealized attenuation characteristics of a pair of separating filters for use with this assignment of frequencies. The lower of the two is so designed that each filter transmits only those frequencies which are assigned to one particular purpose. Such filters would be used for separating into individual circuits the currents used for carrier telephony, carrier telegraphy, ordinary telephony and ordinary telegraphy and thus facilitating their distribution in the central offices.

General. The electrical design of carrier systems is determined in large part by the problems which arise in the transmission of the carrier currents over the line wires. The comparatively high frequences used in carrier transmission attenuate much more rapidly in passing along the lines, and have a much greater tendency to cause interference in adjacent circuits than do the ordinary telephone frequencies. Both attenuation and interference increase rapidly with increase in frequency. Because of this it has been found most economical to make use of the frequency range commencing immediately above the voice range. The systems which have so far been put into commercial use employ frequences up to about 30,000 cycles.

Because of the high attenuation and interference, carrier transmission is particularly dependent on the use in the circuit of repeaters placed at comparatively frequent intervals. To indicate the importance of repeaters, it is interesting to note that if the Harrisburg-Chicago carrier telephone system, which spans about 750 miles, were operated without repeaters, it would be necessary under the most favorable line conditions to apply at the sending end of the highest-frequency channel a power of 60 kilowatts. By the use of intermediate repeaters the high-frequency power at no point exceeds 0.1 watt.

Some of the experimenters in this art have had the misconception that the mode of transmission of the high frequencies employed in carrier operation was different from that of the ordinary telephone frequencies, and that the carrier frequencies had some unexplained property whereby, although guided by the line wires, large energy losses in the line wires were avoided. There is, however, no theoretical or experimental basis for this idea. As a matter of fact, the line attenuation of carrier currents is considerably greater than for telephone frequencies and increases rapidly with frequency, due to the increased resistance of the line wires, and increased effective leakage between the line wires at the carrier frequencies. While it is, of course, proper to picture the mechanism of carrier transmission as one in which the energy is contained in the electromagnetic waves, which are guided by the line wires, this is no less true for the transmission of low frequencies. The difference between radio and wire transmission, whether of high or low frequency, is the difference between unguided and guided waves.

Cable. Transmission over cables will be discussed here in connection with the unavoidable use of short lengths of cable in open wire lines, for toll entrance in bringing the circuits into the central offices, at river crossings, in passing through cities, etc. Such lengths of cable have two effects:

a. They introduce a considerable transmission loss due to the inefficiency of cable circuits at these higher frequences; and

b. They introduce a large irregularity in impedance characteristics which, in systems depending on balance for duplex operation, affects radically the amount of amplification which may be obtained at repeater points.

To reduce both the attenuation of the circuits at these frequencies and the impedance irregularity which short lengths of cable introduce, there has been developed a system of coil inductance loading.

Loading for Carrier Frequencies. The loading systems which have been developed for cable are adapted to transmit frequencies up to about 30,000 cycles. The coils are spaced about 1000 feet apart, and the amount of inductance is chosen so as to give the cable circuits the same characteristic impedance as the lines to which they are connected. The decrease in irregularity in impedance as the frequency increases is due to the fact that the attenuation increases with frequency, so that the cable, for instance, at Altoona, is electrically farther away at the higher frequencies. Since, however, the large attenuation has to be made up by larger repeater gains, the smaller apparent irregularity at the higher frequencies is of equal or greater practical importance than that at low frequencies. It will be noted, furthermore, that the loading largely overcomes the effect of the two lengths of cable. The slight remaining reactance component, which occurs at the higher frequencies, is largely due to the office wiring at the end where the measurements were made; and the slight remaining irregularity is due to some office wiring at Altoona.

Under some conditions it has been found convenient to leave lengths of cable in carrier systems unloaded, and to install auto-transformers between the cable and the open wire circuits to reduce the reflection losses introduced by the cables.

(*To be Continued*)

It was seventy-seven years ago on May 24th that Professor S. F. B. Morse sent the first telegram from Washington to Baltimore. The telegraph is recognized as among the foremost serviceable wonders of the world. Without this invention the world would be slowed down in nearly every respect. The newspapers would be without foreign news and even news from nearer sources would be fragmentary. Business transactions would be long pending. The inventor sent his first message over a wire strung on slight short poles. The inventor rather than expressing elation was awed by what he had brought into being and his first message was: "What hath God wrought?"

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The Side Switchless Connector

By HARRY E. HERSHEY,
Of the Automatic Electric Company, Chicago

(Continued from page 246, June 1st Issue)

In Fig. 16 is shown a complete circuit embodying all of the functions that were previously discussed in detail. In the figure is shown the familiar line relay L, release relay R, series relay S, instantaneous ring cut-off relay C, busy relay B, back bridge relay BB, wiper cut-off relay W, release magnet Y, vertical magnets VM, rotary magnets RM, and the slow acting relay A.

When a connection is extended to this switch the relays L and R operate in the usual manner. We will now assume that the subscriber dials the figure 6. As the dial returns to normal the circuit of the line relay L is momentarily opened six times.

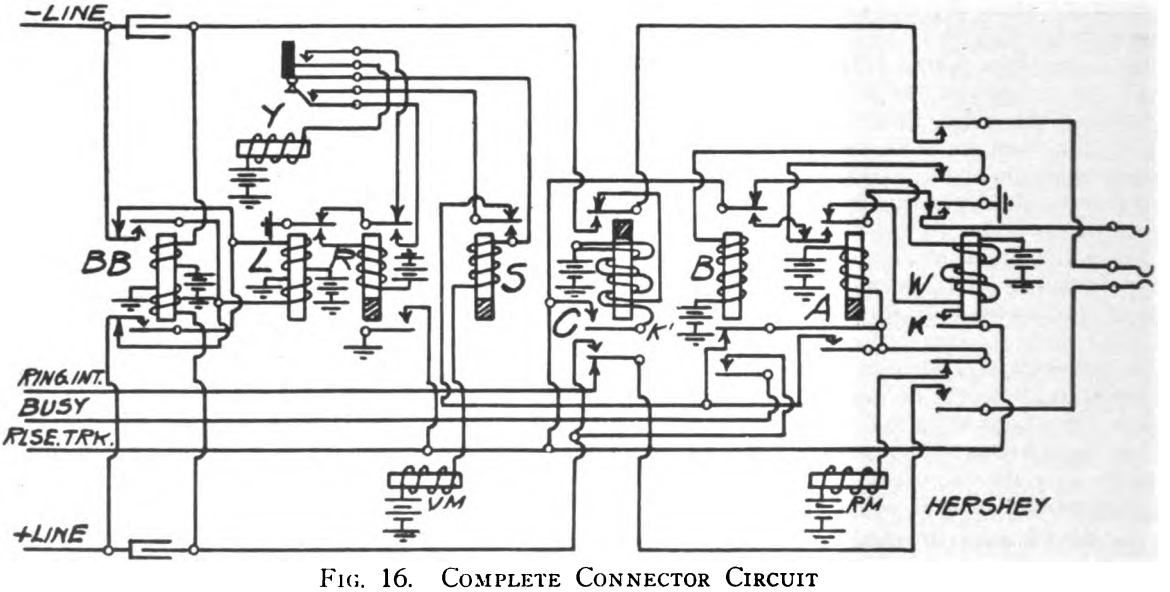

FIG. 16. COMPLETE CONNECTOR CIRCUIT

Each time the armature of relay L falls back it opens the circuit of relay R. Relay R does not de-energize, however, on account of its being a slow acting relay. The first time the armature of relay L falls back a circuit may be traced from ground, break springs relay L, make springs relay R, break contact off normal springs, relay S, through vertical magnet to negative battery. The current flowing in this circuit will cause relay S and the vertical magnet to operate. Relay S, being a slow acting relay, will maintain its armature in an operated position for the fraction of a second. The next time the armature of relay L falls back the same circuit is closed, except that since the shaft has already been raised one step the circuit will pass through the make contacts of the off normal springs and the make contacts of relay S. Shortly after the last impulse of current has passed through the relay S, it will de-energize and cannot again become energized on account of the open circuit at the off normal springs.

All is now in readiness for the subscriber to call a second figure. Let us assume that the subscriber dials the figure 5, thus opening the line circuit five times and causing the line relay to momentarily release its armature a like number of times. Each time the line relay L de-energizes, a circuit may be traced from ground, break springs relay L, make springs relay R, make off normal springs, break springs relay S, break springs relay B, through relay A to negative battery. A branch of the above circuit may also be traced from break springs relay B, break springs relay W, through rotary magnet to negative battery. The current flowing in this circuit will cause the rotary magnet to energize five times, and thereby rotate the shaft and wipers into engagement with the bank contacts associated with telephone number 65. The relay A will energize at the first impulse, and will remain in an operated position until shortly after the last impulse has passed through it. Relay A carries a pair of make springs which short the break springs of the relay B. Should the private wipers pass over several consecutive busy contacts in the level the relay B has a tendency to operate, and if it were not for the above provision the circuit to the rotary magnets might be opened.

When relay A de-energizes, following the last impulse, a circuit may be traced from "release trunk ground," break springs relay B, low winding relay W, break springs relay A, break springs relay W, private wiper, through the B.C.O. to negative battery. The lower winding of relay W will energize sufficiently to close the springs K. When the springs K are closed a circuit may be traced from release trunk ground, springs K, high winding of relay W, to negative battery. The current flowing in this circuit will cause relay W to become fully operated. Direct ground is now placed on the private bank contact by the springs of relay W. This operation of relay W will be so slow that the B.C.O. of the called line switch will have sufficient

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time in which to clear the called line of attachments.

The switch is now in position to signal the called party, and a circuit may be traced from the ring interrupter, break springs relay C, make springs relay W, ringer and condenser at the called telephone, make springs relay W, break springs relay C, low winding relay C, to negative battery. The condenser will prohibit the flow of direct current in this circuit, but the alternating current will cause the ringer at the called substation to be operated. The alternating current passing through the low winding of relay C does not cause it to energize, as was explained in the May 16th issue. Let us assume that the called subscriber removes his receiver during the time that the generator is in the circuit. As soon as the transmitter and receiver are bridged across the line there will be a flow of direct current, over the above traced circuit, in addition to the alternating current already flowing. This flow of direct current will cause relay C to attract its armature. The springs of relay C are arranged so that springs K′ make before the other springs are operated. When the springs K′ are made a circuit may be traced from release trunk ground, spring K′; high winding of relay C, to negative battery. The current flowing in this circuit will cause relay C to become fully operated and cut the back bridge through to the line wipers.

A circuit may now be traced from ground, lower winding of relay BB, make springs relay C, make springs relay W, to called telephone, make springs relay W, make springs relay C, upper winding relay BB, to negative battery. The talking battery will be fed to the called subscriber over the above traced circuit, and the relay BB will also operate to reverse the polarity of the calling line.

Upon the completion of the conversation the restoration of the receiver to the switch hook at the calling substation will bring about the release of the switch in the usual manner.

If the called line is busy its associated private bank contact will be grounded and there will, of course, be no circuit for the low winding of relay W. A circuit, however, may be traced from ground at the private bank contact, break springs relay W, make springs relay A (just before it de-energizes following the last rotary impulse), break springs relay W, relay B, to negative battery. The busy relay B will energize over this circuit and will give the calling subscriber the busy tone in the usual manner. At the same time the busy relay B forms a locking circuit for itself which may be traced from release trunk ground, make springs relay B, break springs relay A (which has by this time de-energized), break springs relay W, relay B, to negative battery. The busy relay also opens the circuit to the low winding of relay W; if it were not for this provision the relay W would be energized if the called line became idle while the calling party was receiving the busy tone. In addition, the busy relay opens the circuit to relay A and to the rotary magnet, which prevents further rotation should the subscriber operate his dial while listening to the busy tone. When the calling subscriber hangs up his receiver the release takes place in the usual manner.

As has been previously mentioned, relay B might become energized if the private wiper passes over several consecutive grounded contacts. If it should happen that 65 was dialed while the other lines in the level were busy the relay B would pull up and, when relay A de-energizes, would lock itself up if it were not for the fact that its circuit passes through a pair of break springs on relay W.

The reader's attention is also called to the fact that relay W, upon energizing, opens the circuit to the rotary magnets, thus prohibiting further rotation should the subscriber again operate his dial.

FUNCTIONS OF THE CONNECTOR RELAYS

A. The Line Relay. Receives the dial impulses and repeats the same to the vertical and rotary magnets, and also serves to feed talking battery to the calling subscriber.

B. The Release Relay. Operates to prepare the circuit of the rotary and vertical magnets, and in addition maintains the circuit of the release magnet open until such time as the conversation is completed.

C. Series Relay. Operates in series with the vertical magnets.

D. Busy Relay. When a busy line is encountered this relay gives the calling subsbcriber the busy tone, and in addition opens the circuit to the rotary magnets so that a further rotation of the switch is impossible.

E. Inst. Ring Cut-Off Relay. Impresses ringing current upon the called line and operates to cut off the ring instantly when the subscriber answers.

F. Back Bridge Relay. This relay feeds talking battery to the called subscriber, and operates to reverse the polarity of the calling line.

G. Wiper Cut-Off Relay. This relay cuts the connector through to the wipers when an idle line is reached.

H. Vertical Magnets. Operate to raise the shaft and wipers to a position opposite the desired level of bank contacts.

I. Rotary Magnets. Operate to rotate the shaft and wipers into engagement with the desired bank contact.

J. Release Magnet. Operates to remove the double dog and thus cause the return of the shaft to normal.

K. Rotary Control Relay (A). Operates in parallel with the rotary magnets, and closes the circuit through to the busy relay.

(To be continued)

IN RENEWING his subscription for another year, T. P. McBey, of the Canadian Pacific Construction Department, Vancouver, B. C., writes: "My very best wishes for your continued success and long life to the AGE and its publisher."

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The Task of the Telephone

Extracts From a Recent Address Delivered Before the Electric Club of Chicago, by B. E. Sunny, President of the Chicago Telephone Company.

In the early days of the telephone and for some time after the business got under way, there were many men who knew about all there was to be known concerning the entire telephone business, but in its growth, it was soon necessary to make divisions and then subdivisions, so that for a long time, as with many other industries, it has been highly specialized.

The business is now of such mammoth proportions that even the men who are engaged in it sometimes find it difficult to get anything like a complete picture of many of the operations.

Telephone service necessarily depends upon coordination, co-operation and the highest type of teamwork, not only by the telephone employees, but the subscribers and their employees. There are other lines of business, of course, where these factors are important, but I doubt if as much so as with the telephone. If you have an electric light on your table, it does not impair its value to you if no one else has one. If you have gas in the kitchen range to cook your breakfast, it does not affect you if no one else has it. If, however, you have a telephone, it is of no use to you whatever unless your neighbors are similarly equipped—and its value to you depends upon the telephone company's employees and the list of people with whom you can talk.

During the month of April, 27,100 telephone moves were made in Chicago, and two-thirds of these were in the last 15 days of the month. We put in, moved or took out four telephones a minute. In the first half of May 40,700 move orders were completed—one every ten seconds for nine hours a day.

That part of the telephone service in which the layman has the largest interest is with relation to the traffic. He is in contact with the telephone operators at his office and at his home, and he has more or less curiosity to know how the business is conducted. The experience in dealing with the traffic problem at Chicago is generally applicable to metropolitan cities, although during the period of war activities, in New York, Washington, and a few other places, the burden on the telephone service was more severely felt than in Chicago.

In Chicago, in 1920, we required about 8,000 operators, and we were short of that number throughout the year from 600 to 1,500. We lost the equivalent of 6,800 operators through resignations and dismissals during the year. About 4,900, or 65 per cent. of the number that we started with, remained throughout the year, and the losses were largely of operators who remained only one or two months.

To fill vacancies, we employed and trained 4,250 operators, and we re-employed 3,550 ex-operators who needed little or no training. There were 1,150 additional applicants who passed the examination and started in the school, but who were dropped or who resigned before finishing the training course.

Nineteen hundred twenty was perhaps the hardest year that we have ever had in securing and holding a competent staff of operators. We shall probably never have its like again. Since January first this year, the situation has changed markedly and favorably. The losses in operators have fallen off, although until recently they have continued to be quite large.

As indicating the extreme care exercised to fill the positions with competent operators, you will be interested to know that from January to March, inclusive, this year, we considered 4,600 applications, only 2,000 of which were by persons suitable for the service, or who could pass the necessarily strict examination. Of this number, 450 were subsequently sent away because of failure to pass the first medical examination.

Unsatisfactory pulse and temperature	193
Unsatisfactory kidney condition	75
Defective vision	80
Defective hearing	27
Unsatisfactory heart action	17
Unsatisfactory thyroid	14
Defective teeth	7
Miscellaneous	37

In each case the applicant was advised of the result of the examination and urged to place herself under the care of her family physician. In almost all cases the applicants did not know that there was anything wrong, and their condition, if incipient tuberculosis, for example, might have gone beyond the point where it could have been checked. These examinations are not only valuable to the service, but they are of great help in lifting the average of the health of the community.

Of the number whom we could not accept for the reasons just explained, 300, or two-thirds of the total, subsequently returned, having had their troubles remedied, and successfully passed a second medical examination and were put to work.

Besides having a good general education and good health, the attitude of the applicant toward her work, the subscribers and her associates must, of course, be right. There is no room in a telephone office for a grouch. A sore head is as bad as a sore thumb.

Occasionally friends who send applicants to us who fail to pass say that we are too exacting, but we feel that we are justified, over and over again, in view of the vast importance to the business and domestic routine, of the enormous volume of traffic which a telephone exchange is called upon to handle every day.

While the conditions of entrance into the service are exacting, and the discipline continuously strict, the company on its part never overlooks the interest of its operators with respect to compensation, health or comfort. In return for a tireless devotion to the services of the public, the company feels

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that there is nothing that it can do for these splendid young women that should for one moment be withheld. At the same time that we have to be very strict, we want always to be very square.

On all of the local connections, there are at least two of the company's operators, and on a very large percentage of all of the business calls where the subscribers have private branch exchange switchboards of their own, there are two additional operators. Frequently there are secretaries or clerks at either end between the calling subscriber and the subscriber called. There are, therefore, between four and eight people in on every connection of the kind, only two of whom are telephone company employees.

The opportunity for error is, therefore, extremely large, and as there is no written record of local connections and the operation is so rapid, when there is error, it is zero in occupation to try to find out who is to blame. That the service goes through as well as it does, is a high testimonial to the co-operation betwen the subscribers and the telephone employees.

The most remarkable teamwork among the employees of the telephone company, and where the value of the training is clearly shown, is in the long lines service, particularly on the circuits between the Atlantic and Pacific coasts.

The average calls per day on the Chicago-San Francisco circuit for February was 130. Thirty-six per cent. of these were at the full day rate; 10 per cent. at the evening rate—that is from 8.30 p. m., until midnight; and 54 per cent. at the night rate—that is, between midnight and 4.30 a. m. This is the traffic of Chicago and the East with the Pacific Coast. The day traffic is largely commercial, while the evening traffic is partly commercial and partly social and the night traffic is almost entirely social.

The co-ordination and teamwork with respect to equipment and the operating force may be best illustrated by following through a supposititious call by a Boston broker for—we will say—John Rockwood, at the Hotel Raymond, Pasadena, Cal.:

Boston broker tells his clerk to put in a call for John Rockwood, Hotel Raymond, Pasadena, Cal.

Clerk removes telephone from hook, is answered by the operator on the private switchboard and asks for long distance.

Long distance answers and makes out a ticket, which she sends by pneumatic tube to the routing operator.

The routing operator marks the ticket by the way of Buffalo and sends it by pneumatic tube to the distributing operator.

The distributing operator sends the ticket by pneumatic tube to the operator controlling the Buffalo circuits. This operator calls Buffalo and asks to be connected through to Chicago for a Pasadena connection, and puts Boston and Chicago in communication.

The Chicago operator connects Boston with a special operator in Chicago handling Pacific Coast traffic, who makes out a ticket.

The special operator in Chicago then calls San Francisco; the operator at which point makes out a ticket and calls for Los Angeles, and requests that she be connected through to Pasadena.

Los Angeles connects San Francisco and Pasadena.

Pasadena answers and switches San Francisco to a ticket operator.

Ticket operator makes a record of the connection, secures the number of the Raymond Hotel from an information operator, goes in on a call wire of the proper local exchange and is connected with the Raymond.

The Raymond private exchange operator answers, looks up the room number of John Rockwood and rings him.

Rockwood answers and is ready to talk.

In this routine, we have 18 distinct operations.

As the call has gone through from the Atlantic to the Pacific, the circuits used have been released and it is now the duty of the Pasadena operator to re-establish the circuit step by step from Pasadena to Boston, and in this, there is ordinarily 14 operations.

When Buffalo, Chicago and San Francisco come in, going and coming, the operators controlling repeater sets are signaled to put repeaters into the connection, making in all 38 operations.

Under favorable circumstances, with circuits available, and no delay in finding the called subscriber promptly, the two subscribers can be talking satisfactorily within fifteen minutes from the first call. The average time required to complete a transcontinental connection is one hour, but most of the delay is between midnight and 4.30 a. m., when the lower rate is in effect.

The equipment employed in this remarkable service is of transcendent importance and interest and involves the results of the work of many years and many able engineers and inventors.

In the transcontinental service there are two metallic copper circuits of No. 8 wire from New York to San Francisco through Chicago. There is a third circuit, which is called a phantom circuit, involving no copper at all, but made up by connecting the ends of the two metallic circuits through special and ingenious appliances. Therefore, it is possible to carry on three conversations at the same time between New York and San Francisco on the two physical circuits.

The traffic conditions make it necessary that the circuits when at rest are in the best condition to be put into service quickly, so that the normal arrangement is: One circuit from Chicago to San Francisco; one circuit from Chicago to Denver; and one circuit from Chicago to Omaha.

Chicago handles all of the Eastern traffic with the coast.

The Chicago-San Francisco circuit is equipped with repeaters at Davenport, Iowa; Omaha and North Platte, Neb.; Denver, Col.; Rawlins, Wyo.;

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Salt Lake City, Utah, and Winnemucca, Nev. On a New York-San Francisco call, additional repeaters come in at Harrisburg and Pittsburgh, Pa.; Beaver Dam, Ohio, and Chicago.

It has been frequently said that while Bell's invention was a wonderful achievement, the aggregate of the appliances developed to make the telephone of universal use is still more wonderful.

The vacuum tube repeater now used on all long distance circuits of more than 500 miles is one of these appliances and a recent triumph in telephone engineering, which has taken off the limit to the mileage length of a telephone conversation. A non-technical explanation of the device is that it looks very much like an incandescent lamp that has burned many thousand hours and needs to be renewed.

In operation it is of an entirely different class than the alternating current transformer, which merely changes the character of the current but never delivers at the far end as much as is put in.

The telegraph repeater is still another form and takes what is left of a weak current at the end of 300 or 400 miles of line and is made to do something in a mechanical way, which will reproduce in a new stretch of circuit the original signals. In this system, with every repeater that is added, there is an appreciable loss in distinctness and speed, and the limit of its application is small.

The vacuum tube telephone repeater is a device in which only electrons are set in motion. A weak telephone current entering it, is made to impose all of its characteristic variations upon much stronger current from another source of power, which used to carry the message on to its destination or to the next repeating point.

It differs from the ordinary transformer or repeater in that there is no relation between the amount of energy put into it and the amount of energy taken out of it, just as there is no relation between the amount of energy used by a locomotive engineer in moving the throttle of his engine, and the amount of energy delivered to the driving wheel of the engine.

The vacuum tube repeater is capable of stopping up or re-enforcing telephone currents to an unlimited extent—and a telephone current which is too feeble to be distinctly audible in a telephone receiver, can be made to reproduce all its fluctuations on another current which could be strong enough to kill.

The possibilities of long lines' operations with the vacuum tube repeater are not exhausted in the Boston-Pasadena connection. If circuits were available from Pasadena to Boston by some other route, the Boston broker could have the privilege of talking into one instrument and hearing his voice in another over a distance of 8,000 miles of copper wire.

Carrying on three telephone conversations at one time on two copper circuits is only part of the work done by these circuits. By the use of what is known as carrier telephone and telegraph currents, the circuits can be used at the same time for transmitting a large number of telegrams and printer telegraph messages. These carrier currents are of very high frequency and of varying frequency. They are similar in many ways to those used in the wireless telegraph.

The printer telegraph service operates pretty much as does an ordinary typewriter with the same kind of keyboard, and the printed message comes out at the receiving end on a letter size sheet of paper looking exactly like the work of the ordinary typewriter.

There are two Morse telegraph circuits regularly in use on each physical pair of wires on the transcontinental west of Chicago.

East of Chicago the high frequency carrier telegraph is set up and put in operation every morning at 8.30 and carries a heavy volume of telegraph business throughout the day.

It is possible to transmit on one pair of wires one telephone conversation, four ordinary Morse telegraph messages, 18 high frequency or carrier telegraph messages, and six printing telegraph messages—a total of 29 different operations all at one time.

The actual service between Harrisburg and Chicago is one telephone conversation, 20 telegraph messages, and three printing telegraph messages—a total of 24 different operations on one circuit at one time.

Increasing the Liabilities of Telegraph Companies

The Interstate Commerce Commission has decided that the present rules of the telegraph companies, restricting their liability for negligence in the transmission or delivery, or for non-delivery, of unrepeated and repeated interstate messages are unreasonable.

The commission held that the maximum liability in the case of a message for the transmission of which the unrepeated rate is charged should be not less than $500, and for a message received for transmission at the repeated rate, $5,000, which limitations the Commission found to be reasonable as parts of the prospective rates.

The Commission said that provision should be made for the transmission of valued messages under a liability to the value, stated in writing by the sender of the message, at the time it is offered for transmission, upon payment of the repeated rate plus one-tenth of 1 per cent. of the stated value in excess of $5,000. Commissioner Potter dissented from the opinion.

C. F. AMES, district commercial superintendent, Western Union Telegraph Company, Boston, Mass., writes: "Here's my check for renewal. It would be like missing an old friend if you should forget to renew my subscription."

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The Recent Electrical Disturbances

Recent solar eruptions which caused brilliant auroras and disorganized cable and telegraph service throughout the world may result in the earth receiving an increased quota of sunshine during the remainder of the year, says Sir Oliver Lodge, of London, the noted scientist, and one of the foremost telegraph engineers. He declares it is probable the monsoon will be strengthened, and that in consequence the Indian harvest will be improved. He even ventures the opinion that the electrified particles thrown off by the sun during the disturbance may assist in the development of vegetation and reduce the amount of dust held suspended in the atmosphere.

Sir Oliver says the magnetic disturbances that attended the solar eruption were due to a torrent of electrified particles, which constituted a gigantic electric current. This opinion is also held by Camille Flammarion, the veteran French astronomer, who has expressed surprise at a storm of such unusual violence occurring at this time. M. Flammarion has pointed out that the sun is now at a period of diminishing activity, the eruptions on the surface of the luminary recurring at intervals of eleven years. Sir Frank Dyson, the astronomer royal, declares the disturbances caused by the sun spots were the worst ever experienced in England.

Dr. E. W. Maunder, founder of the British Astronomical Association, who has for a long time made a study of sun spots and of terrestrial disturbances which might be attributed to them, definitely holds that streams of electric particles thrown out into space from the vast whirling cavity, popularly known as a sun spot, cause magnetic storms upon encountering the earth's atmosphere. Dr. Maunder has reached no decision as to the effect of these particles upon the weather, but he agrees the subject is as yet to be thoroughly explored.

Considerable destruction of telegraph, telephone and submarine cable property as a result of the electrical storm was caused in many sections of the world. An entire telephone exchange in Sweden was destroyed by fire as a result of this freak electrical disturbance.

———o———

Notes on Observations of Aurora or Earth Current Effect on Telegraph Wires at Capreol May 14th

Earth current of intensity sufficient to cause a marked reduction in the efficiency of telegraph circuits has been observed at intervals for a day or two previous to May 14th. It apparently reached a climax about 10.30 p. m. on the date mentioned. The trouble persisted until after midnight with such violence that the available measuring instruments were inadequate to measure it, and the wires were opened at 10.30 p. m. to save the equipment. It is, therefore, impossible to say exactly when the maximum disturbance occurred.

At 9.15 p. m. a number 9 copper wire was grounded at Port Arthur, Capreol and Montreal, and milammeter readings taken at Capreol on the West section till 9.55 p. m. recording the maximum current value. At the beginning of the observation the wire showed a low positive potential from Port Arthur, but very quickly reversed to negative, the current rising to about .110 ampere. Frequent fluctuations and a maximum of .125 ampere were observed. The current then reversed and rapidly reached a maximum of .125 ampere positive, reversed to .070 negative and after a few fluctuations again reversed and quickly reached .145 positive. Thereafter until 9.55 p. m. the current, though fluctuating, was always positive. The maximum was .180 ampere. From 9.15 p. m. to 9.55 p. m. there were four complete reversals of polarity.

From 9.55 to until 10.25 p. m. current readings were taken on both East and West sections of the wire at five-second intervals.

The section Capreol to Montreal showed negative potential from Montreal throughout the entire period of observation. The current varied from nearly zero to .130 ampere, until the final flood of current which terminated the readings.

Readings on the section Capreol to Port Arthur followed roughly but by no means exactly, those on the Eastern section, with the opposite polarity, as might be expected. The current from Port Arthur was generally positive, but four times dropped to negative for brief intervals. On the Western section the rise of current which terminated the readings, was very rapid, rising in less than five seconds from a comparatively low value to something in excess of the capacity of our instruments and protecting apparatus. On the East section the rise was much less rapid, occupying fully a minute in reaching the limit of observation.

Before the repeater sets were cut out the carborundum lightning arresters, having a resistance to ground of 50,000 ohms when cold, and connected in multiple with the regluar set ground of 500 ohms and the artificial line resistance of about 3,000 ohms, became white-hot.

After the repeater sets were cut out the current jumped the air gap lightning arresters at the switchboard. Attempts to open wires by removing fuses resulted in pulling out an arc three or four inches long. An attempt to open the line by removing a resistance lamp resulted in setting up an arc across the socket, which was blown out with difficulty.

Simplex telephone circuits were rendered useless by a roaring noise in the receivers, which rose and fell with marked regularity in periods of about two seconds. A telephone circuit became grounded at a lightning arrester. Just what happened on the telephone circuit is not clear, but the trouble was probably due to the fact that the circuit was connected to earth through the simplex.

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History of the Morse Statue in Central Park

By JOHN HORN, Montreal

(*Continued from page 248, June 1st Issue*)

THE FAREWELL WORD

Mr. Orton arose and announced that the hour agreed upon when the wires of the Continent were to be connected with the instrument before him—9 P. M.—had arrived. Professor Morse had prepared a message to be transmitted, the signature to which was to be sent by his own hand. Miss Sadie E. Cornwell, of the New York main office, was led by W. K. Applebaugh to the table, when, amid profound silence, she manipulated the body of the following message:

"Greetings and thanks to the telegraph fraternity throughout the world. Glory to God in the Highest, on Earth, Peace, Goodwill to men." S. F. B. Morse.

She then arose, when Professor Morse, escorted by Mr. Orton, took his seat at the operating table. As his fingers touched the key the excitement was so great that loud cheers rung through the house. Again impressive silence fell. Slowly the sounder struck the letters "S. F. B. Morse," when, as by a common impulse, the entire audience rose, and a wild storm of enthusiasm swept through the house. Professor Morse, visibly affected, resumed his chair beside the president, and for several moments pressed his brow with his hands. The scene was thrilling and impressive.

When the excitement and applause had subsided Mr. Orton rose and said: "Thus the Father of the Telegraph bids farewell to his children."

Immediately thereafter came a torrent of messages from all quarters of the globe, some of which, from Cuba, Singapore, Bombay and Canada were read. Then followed an able address from General N. P. Banks, on the "Telegraph as an Element of the National Defenses," followed by a sparkling and brilliant speech by the Rev. Harry M. Gallaher, which evoked very hearty applause. G. K. Walcott spoke for the operators, and James D. Reid for the ladies, giving, amidst much laughter and cheers, a kiss on their behalf to Professor Morse. Miss Antoinette Sterling sang, with great pathos, "Auld Lang Syne," followed by Hon. Charles P. Daly, who, after an appropriate address, introduced Professor Morse.

As the venerable professor arose to respond the audience burst into a wild, loud cheer of affectionate salutation. It was a moment of surpassing interest. The venerable presence, his quiet and refined dignity, the feeling of relationship between himself and the audience, the consciousness that he was about to say his last words to his telegraphic children, rendered the scene deeply solemn.

After an interesting address, in which he carefully reviewed the work of the life he closed as follows:

"When I consider that He who rules supreme over the ways and destinies of man often makes use of the feeblest instruments to accomplish His benevolent purposes to man, as if, by grandest contrast, to point the mind with more marked effect to Him as their author, I cheerfully take my place on the lowest seat at His footstool.

"It is His pleasure, however, to work by human instrumentality. You have chosen to impersonate, in the statue this day erected, the invention rather than the inventor, and it is of no small significance that in the attitude so well chosen, and so admirably executed by the talented young sculptor whose work presents him so prominently and so favorably before you, he has given permenance to that pregnant and just sentence which was the first public utterance of the telegraph: 'What hath God wrought.'

R. B. HOOVER, LOS ANGELES, CALIF.

"If modern progress in the arts and sciences have given unprecedented facilities for the diffusion of the telegraph throughout the world, back of all are the former discoveries and inventions of the scientific minds of Europe and America—Volta, Oersted, Arago, Schweigger, Gauss and Weber, Steinheill, Faraday, Daniell and Gove, and a host of brilliant minds in Europe, with Professors Dana and Henry, in our own country, in the past, and the more modern discoveries and inventions of Thomson, of Whitehouse, of Cooke, of Varley, of Glass and Canning, and numerous others. These all, in a greater or less degree, contributed to the grand result.

"There is not a name I have mentioned, and many whom I have not mentioned, whose career in science or experience in mechanical engineering and nautical tactics, or in financial practice, might not be the theme of volumes, rather than of brief mention in an ephemeral address.

"Tonight you have before you a sublime proof of the grand progress of the telegraph in its march around the globe.

"It is but a few days since that our veritable antipodes became telegraphically united to us. We can speak to and receive an answer in a few sec-

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onds of time from Hong Kong, in China, where ten o'clock tonight here is ten o'clock in the day there, and it is perhaps a debatable question whether their ten o'clock is ten today or ten tomorrow. China and New York are in interlocutory communication. We know the fact, but can imagination realize the fact? But I must not further trespass on your patience at this late hour.

"I cannot close without the expression of my cordial thanks to my long-known, long-tried and honored friend Reid, whose unwearied labors early contributed so effectively to the establishment of telegraph lines, and who, in a special manner, as chairman of your Memorial Fund, has so faithfully and successfully and admirably carried to completion your flattering design.

"To the eminent Governors of this State and the State of Massachusetts, who have given to this demonstration their honored presence; to my excellent friend the distinguished orator of the day; to the Mayor and city authorities of New York; to the Park Commissioners; to the officers and managers of the various, and even rival, telegraph companies, who have so cordially united on this occasion; to the numerous citizens, ladies and gentlemen; and, though last, not least, to everyone of my large and increasing family of telegraph children, who have honored me with the proud title of Father, I tender my cordial thanks."

At the close of Professor Morse's address, which was listened to throughout with the deepest interest, and was delivered in a clear, steady voice, in which there was no evidence of feebleness or decay, on invitation from Mr. Orton, Rev. Dr. Ormiston uttered the benedictory prayer, and the services ended.

When the exercises closed a large number of persons availed themselves of the opportunity to shake hands with Mr. Morse, and near midnight the Academy doors were closed, and the great day ended. It was a remarkable circumstance that near midnight, as the great audience was leaving the Academy, a magnificent auroral display appeared in the sky, as if the elements were in joyous sympathy with the occasion, and lighted their electric fires on that tranquil summer's night to testify their approbation.

R. B. Hoover, who is given the honor of having suggested the erection of a bronze statue to Professor Morse, is now, as has already been stated, a resident of Los Angeles, Cal. In a recent letter from Mr. Hoover he says:

"I am reminded of the honor I had in suggesting to the telegraph fraternity the testimonial to Professor Morse, and which project could not have been brought to such a happy conclusion without the generous and enthusiastic support of the predecessors of the TELEGRAPH AND TELEPHONE AGE and its then illustrious editor, James D. Reid.

"One by one the leaders in that work of love and appreciation are passing down the shady side of the great divide to meet the dear professor on the other shore, but it is pleasing to know that their places are being filled by those who are eager and proud to measure up to the duties and requirements of the new age of electricity in its various contributions to the business and happiness of the world. You are doing your share in this good work, and the apparent prosperity of the AGE shows how it is appreciated and sustained by the fraternity.

"I send through you a greeting to all my former telegraph friends in the East, and again assure you of my appreciation of your thoughtful kindness."

R. B. Hoover was born at Lewistown, Pa., in 1844. At the age of sixteen he was bound out as an apprentice on a weekly newspaper. At the same time he was a drummer boy for the Logan Guards, a Pennsylvania militia company. When the Civil War broke out this company was the first troop to reach Washington City in response to President Lincoln's call. The authorities refused to muster in young Hoover on account of his age. Ascertaining that he could get into the United States Military Telegraph Service regardless of age, Mr. Hoover learned telegraphy with E. W. H. Cogley, now living, at the Lewistown station of the Pennsylvania Railway. After a short service as drum major of the Thirty-sixth Pennsylvania Regiment, during the Gettysburg campaign, Mr. Hoover went into the United States Military Telegraph Corps, Department of the Cumberland, under Captain J. C. Van Duzer, and served there until the close of the war. In 1865 he went to Ohio, to engage in the grocery business, and had a test Western Union station in his store, on the Wheeling and Columbus line. In 1868 he went to Allegheny City as manager for the Western Union Telegraph Company, under Captain T. B. A. David. In 1872 Mr. Hoover went to Marietta, Ohio, where he assisted in building a railroad north to Canal Dover, Ohio, and was joint superintendent of telegraph with the Western Union and the railroad company until 1882, when he went into the telephone business with Charles P. Ross. He was later sent to Springfield, Ill., as superintendent of the Central Union Telephone Company. In 1892 he was sent to Springfield, Ohio, to represent the same company, and was with them practically until he retired under the age pension plan of the Bell Telephone Company in 1914. Since that time he has resided in Los Angeles, Cal., at 3309 West 27th Street.

THE New York Telephone Company's exchanges in New York City are frequently asked in these days to give the caller, Havana, Cuba. In a minute or two the reply comes back, "Oiga," which is the Spanish equivalent of our telephone salutation. Literally it means, "I listen."

Practical Lessons in Electricity, by Millikan-Crocker-Mills, price $2.00 per copy. The book measure 5½ inches wide by 8½ inches in length. It is a simple presentation of fundamental electrical principles and their application to direct and alternating current problems.

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY.

By Louis Casper.

Lesson 29

Impedance

In a polar duplex circuit whether operated on the Morse or Automatic principle, there are three factors which influence the current, due to any e.m.f. imposed upon such circuit by means of a pole-changer or transmitter, whether hand or tape controlled. These are resistance, inductance and capacity. In some circuits one or two of these may be quite negligible, but theoretically they are always present. They are, furthermore, so interwoven that they cannot be separated from each other but, nevertheless, they may be treated as though they were separate and integral parts of the circuit.

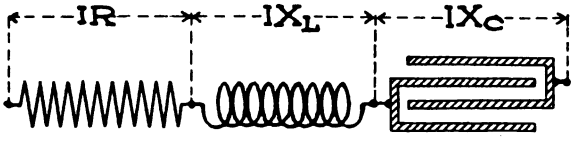

FIG. 74

The resistance factor is indicated at the left of Fig. 74, the drop of potential caused by this resistance being equal to the product of the current I and resistance R, just as it would be in a direct current single Morse circuit. In the center of the figure we have an inductance factor, the drop resulting therefrom being equal to the current I times inductance reactance X_L. The meaning of the latter term as given in Lesson 27 is exemplified by the formula $X_L = 2\pi f L$; where X_L = the inductance reactance in ohms; $\pi = 3.1416$; f = the frequency, and L = the inductance in henrys.

The drop I times X_L represents a drop in voltage which is not taken into account in direct current circuits. The inductance of a given circuit like resistance and capacity is constant. As stated in the two preceding lessons and explained by means of Fig. 69, Lesson 28, inductance is analogous to mechanical inertia, while capacity (IXc) may be compared to mechanical elasticity. With *continuous* current, inductance and capacity have no effect upon the current, but when the latter is varied or alternated, their effects come into operation. If we were to assume a circuit in which there is only resistance, the current would rise and fall with the e.m.f. and would therefore be in phase with it. In a circuit with only resistance and inductance, the effect of the latter would be to retard the rise and fall of the current, which would lag behind the impressed e.m.f. by an angle depending upon the value of the sum of the resistance and reactance in the circuit.

At the right of Fig. 74, we have the capacity IXc, and the drop in potential due to it is equal to the current I times capacity reactance Xc. This capacity reactance, we have seen, has exactly the opposite effect as the inductance reactance and tends to neutralize it, where the elements are connected in series as shown in the figure.

The three factors mentioned, namely, resistance, inductance and capacity, make up the total resisting influence which limits the current in a circuit through which signals of alternate polarity are being transmitted and this resisting influence is known as the *impedance* (symbol Z). This impedance has exactly the same meaning in an alternating current circuit as the ohmic resistance has in a direct current circuit. Knowing the impedance we need merely divide the impressed e.m.f. by it to find the current.

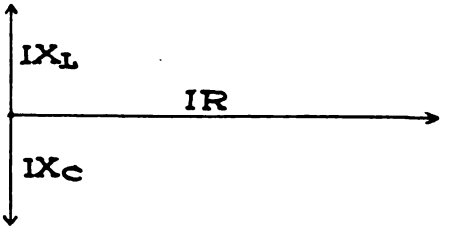

FIG. 75

The first step in finding the impedance is to obtain the resultant of the inductance reactance and the capacity reactance. Since their effects, as already intimated, are directly opposed to each other, we need to merely subtract the lesser effect from the greater effect. We can do this by means of a Vector diagram as shown in Fig. 75. In this diagram the value of X_L is placed above IR and Xc below IR. If both are of the same length, they cancel each other and nothing remains but the loss due to I times R, the same as in a direct current. If one reactive effect is greater than the other, there

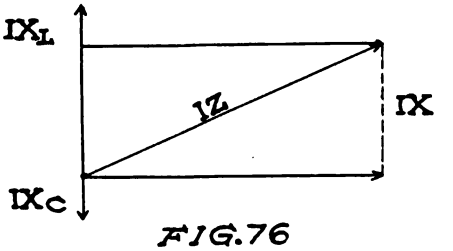

FIG. 76

will be a length of line left either above or below IR. We can calculate the impedance by constructing a parallelogram (Fig. 76) similar to that shown in Lesson 26. A vertical line is drawn to represent the current multiplied by the inductance reactance IX_L, as shown. Opposite this a line is laid out to represent capacity reactance multiplied by the current as shown by line IXc. In addition to this, the line IR is extended to represent the product of the current and the ohmic resistance. If the lines IX_L and IXc are of equal length, they cancel each other, and we have simply the ohmic drop to contend with.

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If they are of unequal lengths, the shorter is subtracted from the longer and a diagram is constructed using IR as the horizontal size and IX as the vertical side. The hypothenuse of this triangle gives us the impressed voltage which is equal to the current times the impedance, or IZ. The value of the hypothenuse divided by the current will give the impedance. The net reactance of the circuit is the algebraic sum of X_L and X_C and such reactance is known by the symbol X.

When X is known, the impedance diagram is made up as shown in Fig. 77, R being laid off horizontally and X vertically. The relation between R, X and Z is exactly the same as that between IR, IX and IZ.

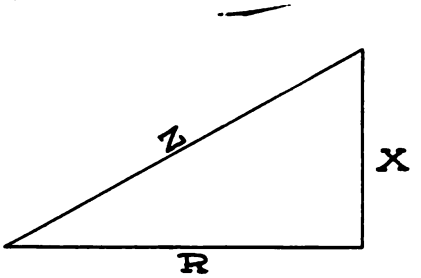

FIG. 77

We can substitute the Vector diagrams by calculating the reactance from the following formulas:

$$X = 2\pi fL = \frac{I}{2\pi fC}$$

and

$$Z = \sqrt{R^2 + X^2}$$

Knowing the impedance and the current, we can determine the drop in voltage by multiplying the current by the impedance.

We can further apply the principle of impedance in its relation to Ohm's law by substituting the impedance for the ohmic resistance, then the same interrelation in an alternating current circuit exists as in a direct current, viz:

$$I = \frac{E}{Z} \qquad Z = \frac{I}{E} \qquad E = ZI$$

where E stands for voltage, I for current and Z for the impedance.

Wattless Current

The term wattless current is generally applied in the consideration of alternating current power problems. It has, however, some bearing in the discussion of certain factors that serve to hinder the full and free flow of the normal current in a duplex telegraph circuit. This is due, as has been frequently stated, to the presence in the latter circuit of the counter forces of inductance and capacity. These two factors have a tendency to cause the operating current to be out of phase in the e.m.f. This difference of phase is responsible for the so-called wattless or idle current.

This current does no useful work, being out of phase, as stated, with both the e.m.f. and operating current. It creates, however, to a certain extent, a heating effect in relays or any other apparatus that may be in series with the line and also causes a drop in potential just as much as though it was actually performing a useful function. It is analogous to an engine working against a spring. The energy delivered to the spring during the piston stroke is returned in the next stroke following. No useful work is done, but the machinery is under strain nevertheless.

In alternating current power circuits the e.m.f. and current are often out of phase and as a consequence, the product of the volts and amperes does not give the true power.

The difference between the true and the apparent power is said to be due to a wattless current. This is termed in most text books as a wattless component as opposed to power or energy component of current.

(*To be continued*)

The Variation of Radio Signals

M. S. Kintner, vice-president of the International Radio Telegraph Company, Pittsburgh, Pa., presented a comprehensive paper, giving detailed results in a long series of measurements of the variation of signals received from transatlantic stations, before the Institute of Radio Engineers, New York, at the June 1st meeting. The International Radio Telegraph Company established observation stations in Maine and in New York and checked the variation of signal strength from day to day and hour to hour, for a period of many months. Large changes in signal intensity were observed and their strength in comparison with that of atmospheric disturbance was noted. Special experiments to determine the effect of the sunsets were made, and on the long wave lengths used no invariable law of falling off was determined.

Interesting mention was made of the variations in apparent direction from which the local high power signals seemed to arrive. It was pointed out that the long distance signals from the other side of the ocean appeared to remain constant in direction. A detailed description of the apparatus used was given, and some computations stated as to the variation of signal intensity with distant wave lengths and absorption. The paper was followed by lengthy discussions on methods of measurement of signal intensity, in which Captain Ranger, Mr. Weinberger, Major Kimzie, Mr. Cutting (who presided at the meeting) and John B. L. Hogan, who took a prominent part.

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EDITORIAL COMMENT

THE recent floods in Colorado and adjacent territory did considerable damage to telegraph and telephone property. The companies, however, were equal to the emergency and within a day or two had telegraphic communication with the outside world restored, and within three or four days the wire facilities were normal. The companies, however, experienced great difficulty in effecting delivery of messages in Pueblo and other cities. The people, by reason of the flood, had become widely scattered and could not be readily found. The vast accumulation of telegrams, however, was cleared up within a week, which speaks well for the management of the wire companies.

Considers New Cable Law

Associate Justice McKenna, of the United States Supreme Court, at its session on June 6th asked the solicitor general and counsel for the Western Union Telegraph Company to submit briefs before the next term as to the effect of the recently enacted cable law upon the suit now pending in the court growing out of the refusal of the Government to permit the landing of a Western Union cable from the Barbados at Miami, Fla.

The new law gives the President full authority over cable landings and members of Congress have contended that its enactment would make unnecessary a decision by the Supreme Court in the pending case.

The Telegraph and Telephone in China

It is stated that nothing in the shape of American telegraph and telephone apparatus has yet been established in China. The Danish and Japanese manufacturers control the situation in that country, furnishing European equipment or Japanese apparatus, such as Undulators, Wheatstone and Inkwriters instruments. All the telegraph work is done on tape. The telegraph sounder, as we know it in the United States, is unknown at the present time in China.

Chinese characters are transformed into numerals of four numeral combinations, and retranslated at the other end from the continental numeral dots and dashes on the tape to the written numerals, and translated into the Chinese characters which they represent.

The first American telegraph equipment is soon to be installed in the central office at Hankow. It consists of motor generators, a storage battery plant and a Western Union Type Pin Jack Switchboard. The same kind of equipment will later be installed in Peking to take the place of practically nothing in the way of inside switching devices. In the near future the American equipment will have been introduced, as it is the most modern in the world. When the two installations at Hankow and Peking are completed, no doubt the Chinese authorities will look to America for additional telegraph and telephone apparatus.

Loanable Funds Inadequate

At a time like this, when the supply of loanable funds is highly inadequate to meet the increasing demand, it is extremely important that bankers exert themselves to the tumost toward the stimulation of saving. A shortage of capital is manifest on every hand. As one evidence it may be noted that money rates are the highest in forty-eight years. Business men will appreciate their responsibility in this matter when they realize the direct relationship between the accumulation of savings and the limits of credit expansion. Just as credit is based upon available funds, capital in turn can come only from savings. There can be no mistake, therefore, about the urgency of drawing every idle and hoarded dollar, and all potential savings, as rapidly as possible into financial channels. Gathered into the banks and the National Treasury this money forms the basis of credit. It has been estimated that the idle and hoarded money alone in America may run into ten figures. Bankers and business men can render the country, as well as themselves, invaluable assistance by co-operating in an effort to draw these funds into circulation.

The condition of world finances demands that new classes of investors be developed. Large investors may be left to themselves but it is essential that small investors be encouraged. The fact is that America has scarcely begun to show the world what she can accomplish through a well-balanced program of industry, thrift, saving and investment. The whole people must co-operate with vigorous determination to accumulate capital. Wage earners can save and invest large sums of money in the aggregate—the success of the Liberty Loan campaign demonstrated this. Thirty million workers saving an extra dollar a week for three years would release an additional $5,000,000,000 for productive enterprises. A properly organized effort, actively supported by bankers, business men and workers, could make this a continuing reality.

FRANCIS M. RYAN of the Research Laboratories of the American Telephone and Telegraph Company and the Western Electric Company, New York, read a paper on "Commercial Radio Telephony" at a meeting of the Radio Club of America, held at Columbia University, New York, on May 27th. His paper was illustrated with numerous lantern slides.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.

1205 Hobart Bldg., San Francisco, Cal.

2044 Railway Exchange Bldg., St. Louis, Missouri.

DIAPHRAGM *Telegraph Sounder*

Better Service Less Cost

Offices provided with Diaphragm Sounders enjoy **uninterrupted** service, regardless of local conditions. Properly attached, they require no further attention. When the relay works—the sounder works, and in perfect unison always.

The Diaphragm Sounder soon pays for itself in the elimination of local battery cost, then continues to give uninterrupted service for many years absolutely free of cost.

Are you taking advantage of the money-saving possibilities of the Diaphragm Sounder? Used by more than 100 Railroads, Pipe Lines and Oil Companies. **Be sure Diaphragm Sounders are on the next requisition.**

Write for descriptive folder

RAILWAYS LABOR SAVING DEVICE CO.
1108 Arlington Avenue, DAVENPORT, IOWA

A Money Saver to Railroads

HALL SWITCH & SIGNAL CO.

Garwood, N. J. Chicago

MANUFACTURERS OF THE

GILL SELECTOR

THE UNIVERSAL SELECTOR FOR TELEGRAPH AND TELEPHONE

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THE RAILROAD

Telegraph and Telephone Section of the American Railway Association

The various committees of the Telegraph and Telephone Section of the American Railway Association, numbering about eighteen, will have their reports in the Secretary's hands by June 15th. These reports will be at once printed and distributed, so as to enable the membership at large to digest the contents in time to discuss them at the meeting of the Association, which will take place at the Hotel Cleveland, Cleveland, Ohio, September 22, 23 and 24.

Railroad Wire Systems Rank High

As communication is necessary for the advancement of civilization, so it is also vitally necessary for the maintenance, operation and development of railroad transportation. Before any project is started, lines of communication must be obtained. In the beginning of railroading the communication was generally served by a single telegraph wire which answered all purposes, including the dispatching of trains, handling of general railroad messages and the commercial business of towns adjacent to and along the railroad.

To keep pace with the growing traffic, the railroads of the New York Central lines have developed a telegraph and telephone plant that includes about 12,000 miles of pole lines and 156,000 miles of wire, of which 65,000 miles are used exclusively for railroad business. This is credited with being the best, as well as the biggest, railroad wire plant in America.

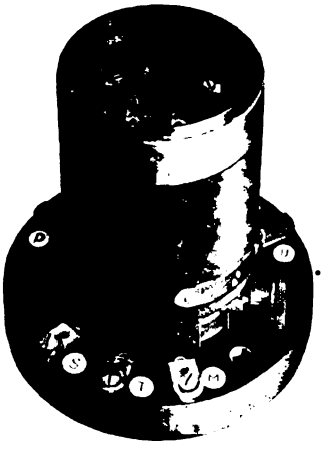
The telegraph was used almost exclusively up to 1907, at which time the telephone was developed for dispatching trains. At present the telephone is used for dispatching on all branches of the railroad. There are also a large number of railroad private long-distance telephone circuits, the principal ones being the extraordinary large gauge copper wire, one pair of which extends from New York to Buffalo, and another pair from New York to Chicago, with branches to Boston, Pittsburgh, Detroit and other places.

Practically all important points between New York and Boston, St. Louis and Chicago are connected in the network of telegraph and telephone service, so that the general and executive officers have instant inter-communicating service.

In developing this wire plant, the telegraph department has made use of the latest inventions, such as the vacuum tube telephone repeaters, composite equipment, "phantom" circuits and Dr. Pupin's "loading" coils, all of which aid in the extension of the range of telephone transmission.

It may be interesting to know that, by superimposing telegraph on telephone wires and coupling up two circuits, several additional telegraph and telephone circuits are obtained without additional cost for wires. For instance, in the case of two pairs of wires put up primarily for long-distance telephone service, these wires, in addition to giving normally two telephone circuits, form between them a "phantom" telephone circuit, which third telephone circuit is obtained by the insertion of special coils at the terminals, thereby forming the third path for the so-called "phantom" telephone circuit. Each of the four wires forming these two pairs of wires is then composited for telegraph circuits, making four distinct telegraph circuits, which can be used for either single or duplex operation.

Summarized, these two pairs of telephone wires would give a maximum of three long-distance telephone circuits and four telegraph circuits, each of which could be duplexed, so that eight separate



Wheatstone Type Polar Relay.

It is protected from dirt and moisture by a cover which totally encloses it, but which is readily removable.

The contact points are platinum.

It is particularly adapted to high speed operation with minimum current.

MORKRUM COMPANY

1410 Wrightwood Avenue

CHICAGO

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telegraph messages could be sent on the wires at one time, while at the same time three separate telephone conversations may be carried on. This method of operation is called "simultaneous telephony and telegraphy," and is being developed fully wherever needed. The New York Central Lines use practically all their wires in simultaneous telegraph and telephone service.

In addition to this multiplex use of circuits for telegraph and telephone, the railroad people have under observation and promotion the further use of existing wires by the employment of the wired radio system of communication invented by Major-General Squier, of the United States Signal Corps, which method employs alternating current of very high frequency, enabling additional circuits of both telegraph and telephone to be obtained from one pair of wires by stepping up each circuit in steps of about 5,000 cycles per second. That is to say, the first circuit on a pair of wires may be obtained at a frequency of 30,000 cycles per second; the next circuit can be obtained at 35,000, and so on up. It is thought practicable to obtain at least twenty different circuits from one pair of wires.

The secretary of the Association, W. A. Fairbanks, of New York, together with W. E. Bell, of the Grand Trunk, Chicago, and J. L. Niesse, of the Big Four, Indianapolis, met in Chicago June 1st, the object being to prepare rules for committee work.

Columbia Dry Batteries Drop in Price

Announcement has been made by the National Carbon Company, Inc., Cleveland, Ohio, of a substantial reduction in price of all standard types of Columbia dry batteries. This reduction in price includes the following brands of dry cells and unit batteries manufactured by the company: Columbia Ignitor, Columbia Gray Label, Columbia Red Label Dry Cells, the Columbia Hot Shot and Columbia Multiple Unit Batteries, and the new Columbia Bell Ringer battery. The three barrel assortments, consisting of different combinations of Columbia Ignitor Dry Cells, Columbia Hot Shots, and Columbia Bell Ringer unit batteries have also been included in the price reduction program. All new prices were effective as of June 1st, 1921.—Advertisement.

Death of Karl G. Roebling, President of the John A. Roebling's Sons Company

Karl G. Roebling, aged forty-eight years, president of the John A. Roebling's Sons Company, Trenton, N. J., died suddenly at his summer home at Spring Lake, N. J., on May 29th. Apoplexy was the cause of death, no doubt brought on by incessant work, as he was known to delight in working days, nights and Sundays. He often remarked hard work was his only pleasure in life. Mr. Roebling was well known in electrical circles and was regarded as one of the best executives in the telegraph and telephone wire industry. About two years ago, Mr. Roebling succeeded C. G. Roebling as president of the Roebling Company.

The wife of Mr. Roebling was a niece of Colonel Robert C. Clowry, a former president of the Western Union Telegraph Company, and a daughter of the late Henry D. Estabrook, counsel of the Western Union Telegraph Company. He is survived by his wife and three children, one son and two daughters, the former being named Robert Clowry.

Colonel. Roebling Heads Company at Eighty-Four

Colonel Washington A. Roebling, aged eighty-four years, was elected president of the John A. Roebling Son's Company, Trenton, N. J., on June 8th, to succeed his nephew, Karl G. Roebling, who died of apoplexy on May 29th. Colonel Roebling announced a vigorous business policy, which includes enlargement of the mills.

Carrying his years lightly, Colonel Roebling talked with genuine enthusiasm of the plans of the company, whose vice-president he had been for many years.

Colonel Roebling is the only surviving son of John A. Roebling, who died while engaged in the construction of the Brooklyn Bridge. Even then he was recognized as an engineer of great ability. He took up the work and directed it to a successful completion. The Roebling plant was established in Trenton by the elder Roebling about seventy-five years ago, and more recently the company built the town of Roebling, N. J., and located important parts of its plant there.

Ferdinand W. Roebling, Jr., secretary and treasurer of the company, will also assume the duties of vice-president. Austin C. Cooley will be secretary.

Telegraph and Telephone Life Insurance Assn.

Assessments Nos. 699 and 700 have been levied by the Telegraph and Telephone Life Insurance Association, New York, to meet the claims arising from the deaths of Edward J. Brand, Charlottesville, Va.; Franklin V. Moffitt, Cambridge Springs, Pa.; George K. Bobb, Baltimore, Md.; Henry H. Atwater, Brooklyn, N. Y.; Henry C. Prentiss, Foxcroft, Me.; Dr. Harvey R. Emery, Newark, Ohio; James A. Britton, Bethlehem, Pa., and Robert Seyboth, Washington, D. C.

Old Time Telegraphers and Historical Ass'n

Thomas E. Fleming, secretary of the Old Time Telegraphers and Historical Association, New York, announces that the next reunion of the Association, which is to take place at Richmond, Va., will occur on October 18, 19 and 20. The headquarters will be at the Jefferson Hotel. The program of entertainment will be announced later. General Jo Lane Stern, of Richmond, president of the Association, desires that the Richmond reunion be well patronized by the membership at large.

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A Problem in Electrical Engineering to the Editor of Telegraph and Telephone Age

DEAR SIR:

Three solutions of the electrical problem printed in your issue of May 1st are given below. Figure 1 shows a plan in which a battery *b* is used at each station with ground return *g g g* are vibrating or single stroke bells. *k k k* are strap keys with upper and lower contacts. It will be seen that this device meets all the conditions; namely, A can signal B and C without ringing his own bell. C can likewise signal B and A. B can signal either A or C without ringing his own bell.

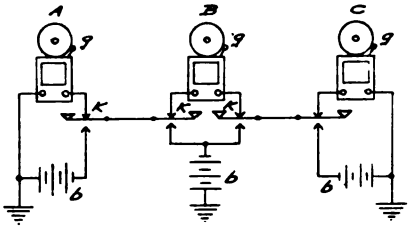

FIG. 1

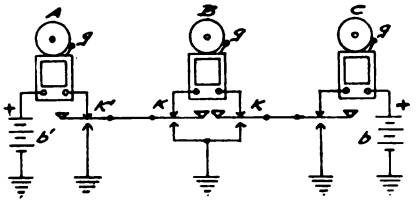

FIG. 2

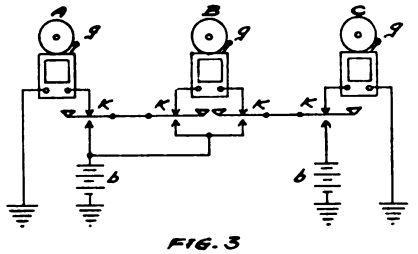

FIG. 3

Figure 2 shows a plan in which the batteries are opposed at A and C; no battery at B. In this case normally no current will flow. When key K' at A is placed to ground it opens battery at A, operating the *bells at* B and C by means of the battery at C. Similary, when key at C is depressed the bells at B and A are operated. The operation of the keys at B rings either A or C as desired.

In figure 3 a device with a metallic return A to B is shown. In this arrangement no battery at station B is necessary, as will be obvious on examination.

In some cases only one wire is available, in which event Figure 2 is probably the best arrangement, inasmuch as it does not require a battery at B. Besides, in case of a ground on any part of the line circuit, or if either of the batteries weaken, the bells will ring continuously (when vibrating gongs are employed,) thereby acting as tell-tales.

A number of solutions of the problem have been received. J. B. Dillon of Denver, Col., and R. E. Day, of La Junta, Col., have sent in the one shown in Figure 1. E. W. Miller of Philadelphia sends in two solutions similar to Figures 1 and 2, excepting that he uses a metallic return in each case. J. J. Ghegan of New York offers a solution in which a metallic return circuit is utilized betwen A and B, with ground return between B and C, but no battery at B. The latter is virtually the arrangement in actual use to which reference was made in my first communication. In this case a good ground was not readily available at B.

To meet the non-electrical requirement whereby the attendant at B may know from which stations, other than his own, the passing signals arise, the code signals from A may employ even numbers. those from C odd numbers.

A communication from Ralph E. Day of Cameron Lake, B. C., has also been received on this subject, but as a diagram did not accompany his letter the exact nature of his solution is uncertain.

Another device which meets the conditions has been received from W. B. Shackleton of Charlotte, N. C., and in which only one battery is used. This device, however, requires three wires for its operation.

For the purpose in question I may add that this code signal arrangement was found to be more satisfactory than the telephone, firstly, because of the noises at the stations of the coal conveyor system, and secondly, because the engineman at the loading station may operate his lever with one hand and signal with the other, simultaneously.

Yours truly,

WM. MAVER, JR.

[The Editor appreciates the interest that our readers have taken in the solution of the electrical problem which Mr. Maver has kindly contributed to our columns.]

Be an Authority on the Telegraph

"Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, offers the most complete study of the telegraph ever published. This standard text-book has been revised and brought up to date, and in addition to numerous diagrams and complete information covering the study of the telegraph, includes full descriptions of the newest apparatus adopted by the Western Union and Postal Telegraph companies, and the equipment of a modern telegraph office. This valuable book, with its 488 pages, 250 illustrations, and carrying an appendix of 24 pages and 16 illustrations covering the new Western Union Multiplex System, is the most sought after electrical book on the market. $2.50 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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PERSONAL

MAJOR GENERAL GEORGE O. SQUIER, Chief Signal Officer of the United States Army, Washington, D. C., sailed from New York for Europe on June 4th to attend the International Radio Conference in Paris. He will represent the State Department and the Army.

WALTER L. JONES and Fred W. Werth have formed a partnership under the firm name of Jones and Werth, to engage in the real estate and insurance business, with offices at 209 Slaughter Building, Dallas, Texas. Mr. Jones was formerly president and general manager of the Postal Telegraph-Cable Company of Texas, which concern surrendered its charter on June 1st of this year. His numerous friends in all sections of the country wish him an abundant success in his new undertaking.

K. P. CHOW, who has been studying the telephone situation in this country for the past year or more, with headquarters at Philadelphia, has returned to China and will be located in Shanghai hereafter.

C. W. GULICK, the old-time telegraph line constructor, of White River Junction, Vt., who has been in St. Paul, Minn., for several months, has returned to White River Junction for the summer.

J. FRANK HOWELL, of New York, is making an extended pleasure trip over the Canadian Pacific Railway System beginning at Halifax, N. S., and ending at Vancouver, B. C., including stops at every important station on the system.

JOHN P. COADY, a well-known telegrapher, now a special representative of the *World-Herald*, Omaha, Neb., writes us that his name recently appeared in our columns, and it brought to light an old friend who has for sometime been located in China. Mr. Coady closes with the remark that verily the TELEGRAPH AND TELEPHONE AGE has a world-wide circulation.

POSTAL TELEGRAPH-CABLE COMPANY

The Colorado Floods

During the floods of June 4th and 5th, which swept through the valley along the Arkansas River, through the eastern and southern parts of Colorado and into Kansas, taking as its toll the lives of many, and causing the property damage that runs well into the millions of dollars, the Postal Telegraph-Cable Company maintained an uninterrupted service from coast to coast and to all points in Colorado and Kansas. At no time was communication completely cut off between Denver and Pueblo, the city that was hardest hit by the flood.

On the afternoon of Sunday, June 5th, to add to the terror of the situation, a terrific cloudburst occurred over Pueblo and the waters came pouring into the Postal office. All those who were in the business section of the town at the time were ordered to flee for safety. Operator Hayden, who was alone on duty at the time at the Postal office, stuck gamely to his post, and when the water had risen to a height of six inches on the floor of the office, Hayden was still despatching news bulletins to New York papers. Additional help from Denver was sent to Pueblo Monday, June 5th, to handle the large volume of messages and press matter.

R. J. HALL has been appointed manager of the Bureau of Tariffs and Taxes, a new department which will take over the work heretofore carried on by the tariff department under the late Isaac Smith, and the work of the tax department, of which Mr. Hall has been in charge for a number of years. The new department will occupy the tariff bureau's quarters on the seventh floor.

M. A. MCCONNELL, who has for some time been in charge of the New York City credit department, has been appointed assistant auditor, and will assume his new duties immediately. Mr. McConnell, prior to being placed in charge of the credit department, was chief clerk in the general manager's office.

R. GOULD, of the plant department, has just completed an inspection trip in connection with line construction work in southern New Jersey.

PAUL CAMPION, junior clerk in the office of the assistant treasurer, died at his home in Brooklyn on June 5th.

Managers Appointed

J. E. Zecher, Atlantic City, N. J.; C. G. Creegan, El Paso, Tex.; Margaret Gaspar, Galva, Ill.; A. Y. Bremerman, Lorain, Ohio; W. M. Olsen, Fargo, N. D.; Chas. G. Noble, Stamford, Conn.; S. J. Babcock, Henderson, N. C.; M. J. Merrimon, Hendersonville, N. C., and R. D. Lucky, Meridian, Miss.

Operating Department

QUAD CHIEF C. W. ORAH is spending his vacation visiting old acquaintances in New Jersey, his former home.

W. S. CLARK, formerly cashier at Los Angeles, Cal., was a recent visitor to the operating room.

PERRY CHAMBERLAIN, who was once an employee of this office, and lately on the Pacific Coast in different capacities, paid us a visit recently.

VISITORS to the operating room for the past month were Messrs. G. W. Ribble, general superintendent, Atlanta, Ga.; Jesse Hargrave, superintendent, Dallas, Texas; H. D. Reynolds, superintendent, Buffalo, N. Y.; also the following managers: Murray, New Orleans; Blume, St. Louis; Grimes, Pittsburgh, Pa.; Boyle, Savannah, Ga.; Weed, Syracuse, N. Y., and Stansell, Richmond, Va.

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THE numerous friends of C. H. Ashburn will be glad to learn that that gentleman's health, after a long rest, is sufficiently restored to enable him to resume the management of the Norfolk, Va., office.

Boston

James D. MacDonald, aged fifty-five years, manager of this company's office at Boston, Mass., died on May 31st. He was born in Nova Scotia and had been in the employ of this company for the past twenty-one years, one year of which as manager at New Haven, Conn. He was one time chief operator in the Boston main office and was later promoted to the managership, which position he had occupied for the past six years. He is survived by his wife and two sons.

E. C. FOLEY is acting city manager in place of J. D. McDonald, deceased.

OUR efficient messenger, Joseph Foley, is still grabbing off lists of telegrams here and there, always on the job. Joseph has only one arm, but he has two good eyes, and no chance to get business ever gets by him. We wish all our messengers would copy his methods.

OUR new office just opened on Massachusetts Avenue, near the corner of Boylston Street, is going strong. We are going to try hard to make it the best appearing office in the city. Manager Pansera is making a vigorous canvass of the call box customers and says the transient business there looks like a wonderful prospect.

EDDIE NAZZARO, our efficient collector, is handling the incoming European steamers at Commonwealth Pier. Eddie is right at ease among the Italian immigrants. He converses with them, acts as interpreter for a great many and picks up a raft of telegrams.

D. H. GAGE, of the electrical engineer's office, New York, was a recent visitor in our main office.

LEO DOMENICHELLI has been assigned to the first New York wire, nights.

THE main office have organized a fast ball club and are willing to meet all comers, here or anywhere. Fifteen wins out of eighteen games last season is a record to boast of.

Philadelphia

CHARLES W. KOFINK, for many years in the service as branch manager with the American District Telegraph Company and the Postal Telegraph-Cable Company at Philadelphia, died on May 5th. He was for some years in charge of the important branch office at 58 North 12th Street.

RECENT visitors to Philadelphia include Manager T. P. Dowd of Washington and R. Gould of the chief engineer's office, New York.

A HANDSOMELY fitted office has been opened in the new Ritz-Carlton Hotel, Atlantic City. Miss Mary B. Fellin is in charge.

MISS F. E. ALBRIGHT is the operator in charge at the Hotel Traymore branch, Atlantic City.

WESTERN UNION TELEGRAPH CO.

THE COLORADO FLOODS

The floods in Colorado on June 4th and 5th did considerable damage to the Western Union plant in and around Pueblo. The basement of the main office was soon flooded, putting the motor-generator plant out of service.

A temporary office was opened in the northern part of the city and every Denver official got into speedy action, which resulted in the restoration of communication in a short time, notwithstanding the fact that the supplies from Denver and other points by railroad were held up at various places on account of flood conditions. Pole lines leading out of Pueblo in all directions were washed away for miles at a stretch.

Messages for delivery were bulletined at the Red Cross, churches and other points of mobilization, which very materially aided in their delivery. The mud in many streets was four feet deep and it can well be imagined what the difficulties were in endeavoring to pass through the slush.

The members of the force worked in water armpit deep in their efforts to restore communication. The water in the railroad station was ten feet deep, and it was impossible to enter any of the offices. Notwithstanding the fact that repeatedly the telegraph forces were ordered to quit their posts on account of an increasing rush of water, each member remained at his instrument, standing in water many feet deep and refused to vacate the premises.

The large staff of employees proved themselves, one and all, to be heroes in this unusual emergency.

A SERVICE in memory of Thomas Frederic Clark, formerly and for many years vice-president of the Western Union Telegraph Company, New York, who retired from active service several years ago, and who died in Ceylon last fall, was held on Tuesday afternoon, June 7th, at four o'clock in the chantry of Grace Church, Broadway and Tenth Street, New York. Many of Mr. Clark's former friends and business associates were present at the services.

M. J. HAYDEN, district superintendent, fourth district, Metropolitan Division, Brooklyn, N. Y., consisting of all of Long Island and Staten Island, has been transferred to the second district, same division, with headquarters in the Flatiron Building, New York. He is succeeded by Charles B McCann, previously in charge of the second district. Mr. Hayden's new territory consists of the district extending from Canal to 42nd Streets. Mr. Hayden's former associates in Brooklyn gave him a farewell dinner and presented him with a gold watch.

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HOBART MASON, circuit layout engineer of Vice-President Fashbaugh's office, New York, has returned from a business trip to Chicago.

C. W. FRY, general supervisor of wire service of Vice-President Fashbaugh's office, New York, has returned from St. Louis, where he attended the funeral of his father-in-law.

C. M. BRENTLINGER, general inspector, returned to Miami, Fla., after an extened inspection trip.

New York Western Union

THE hearty wishes of the Commercial News Department are conveyed to Mr. and Mrs. Thomas Courtney, who spent their honeymoon in the Catskill Mountains.

O. H. BROWNE'S home was again visited by the Honorable Mr. Stork. Welcome to the little stranger.

AUGUST SMITH, former route aid of the Commercial News Department, is now a Morse operator.

A. M. LEWIS, Eastern chief, has returned from furlough.

THE sympathy of the entire force is extended to J. F. McGuire, chief operator of the early night force, whose wife died recently. Mrs. McGuire was formerly Miss Elizabeth O'Flanagan, employed in the Medical Department of the company.

A DINNER was given by the female clerks to Miss Anna Ripola, who has resigned to be married. Before leaving the department the Service Social Club presented her with a chest of silver.

THE outing by the Service Social Club, which will be held on July 10th at Whitestone, Long Island, will no doubt be a great success.

JOSEPH KING, supervisor, has let it out that on June 29th he will be married to Miss Martha Cassidy of the Clerical Department.

THE Association Western Union Employees, Assembly No. 92, Automatic, has chartered a boat for Sunday, August 7th. It is expected that a trip to Bear Mountain or some other resort will be chosen as a picnic ground. Only members of the Assembly and their friends will be eligible to participate.

MRS. HENRY HOFFMAN (nee Sturmer) has resigned to take up domestic duties.

LOUIS KALICHSTEIN has resigned to enter into the dry goods business in Washington. He carries with him our best wishes for his success.

SUPERVISORY territory of Division Traffic Supervisor T. M. Haston has been extended to include Cumberland, Md., and offices in West Virginia.

SUPERVISORY territory of Division Traffic Supervisor C. C. Lever has been extended to include offices in Connecticut.

MISS E. M. STRONG, former division traffic inspector of telephone, has been appointed assistant chief operator of employment of the New York main office.

MESSRS. Barry, Gallagher, Ingham, Saylor and Zucker of the division office, spent Decoration Day at Highland Beach, Long Island, at the establishment of M. D. Shaeffer, who is also a member of the division staff.

HARRY WEINER, formerly employed in the Western Union service in New York, and later superintendent of the Mutual District Telegraph Company, and who went to California many years ago, was in New York on June 7th enroute to Germany.

Eastern Division

THOMAS J. FARRELL, chief clerk to Superintendent W. A. Sawyer, and director in the Serial Building Loan and Savings Institution, New York, attended a convention of the New York State League of Building Loan Associations at Buffalo, June 9th and 10th, as one of the delegates representing the Serial Building Loan and Savings Institution.

L. C. CARMAN, acting manager, Mount Vernon, N. Y., has been transferred to the managership at Troy, N. Y.

H. W. VAN SICKLEN, manager at Middletown, N. Y., has been transferred to the managership at Yonkers, N. Y.

G. E. CORWIN has been appointed manager at Middletown, N. Y.

MRS. BEATRICE MIRADELLA, formerly cashier, Norfolk, Va., has been transferred to Superintendent F. R. Veale's office, New York.

HIRAM F. HORTON, night manager of the Binghamton, N. Y., office, has become a Class A pensioner after forty-five years of service with the company. He will devote his future to farming, he having purchased a farm near Conklin, N. Y.

Pittsburgh

CUPID is making rapid inroads in our organization. The marriage of Miss Louise J. Ouderkirk, our relief branch manager, to W. H. Yates, money transfer agent, and of Miss Ethel Watkins, manager, Fort Pitt Hotel, to Wm. R. Strank, are announced. Both couples have the best wishes of all their associates in the Pittsburgh organization for their future happiness and success.

MISS ELIZABETH POHLOT, stenographer in the office of City Superintendent A. Woodle, will leave the service June 15th to be married to E. L. Besser, Professor of Manual Training, Rogers School.

FOLLOWING the commercial development meeting held in Philadelphia, May 16, 17 and 18, a similar meeting was held in Pittsburgh, May 31, June 1 and 2, with A. C. Kaufman in charge. The meeting was attended by general manager T. W. Carroll, division traffic superintendent J. P. Edwards, district commercial superintendent J. S. Calvert, city superintendent A. Woodle, Pittsburgh local commercial forces, nineten managers and representatives from Superintendent J. S. Calvert's district and a representation from the local plant and traffic

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departments. It was a very profitable and interesting session.

Philadelphia

GEORGE W. SPAID, of the New York banking firm of S. B. Chapin and Co., was a recent visitor to the financial district here. Mr. Spaid is well and favorably known to Philadelphia banking houses, and at one time he was a telegrapher of considerable prominence.

HARVEY WILLIAMS, participant and title holder in numerous telegraph tournaments, is now associated with Redmond and Company, in their stock department. Mr. Williams is past commander of St. John's Commandery, Knights Templar, and was much in evidence during the recent conclave held here.

ROBERT ATKINSON, of the Westinghouse Electric Company, Telegraph Department, and chairman of the committee on membership of the Dot and Dash Club, reports an increase in the number of applicants for membership in the club. He is an enthusiastic worker, and has devoted much of his time to the welfare of the telegrapher.

Boston

H. T. JONES, assistant chief operator in charge of the multiplex department, was married to Miss Margaret Thomas on June 1st. The honeymoon trips included visits to New York and Washington.

JOSEPH CURRAN, operator at this office, died of pneumonia on May 26th, after a short illness. Interment was at Bangor, Me.

SINCE the inauguration of the Portland-Boston multiplex, the Portland office has assumed the relaying of many points in Maine and the White Mountain District. Ten operators were recently transferred from Boston to Portland to handle the situation.

THE Western Union baseball team has enjoyed a successful start for the 1921 season. Their first two games have resulted in 30 to 1 and 18 to 2 victories. This year's line-up includes several players of semi-pro renown and it looks as if the Postal team will be severely beaten if they undertake to oppose the fast Western Union combination. When the two teams met last year the Western Union telegraphers won after a hard uphill fight 9 to 7.

Radio Corporation of America

E. J. Nally, president, accompanied by Mrs. Nally, sailed for Europe June 14th on the steamer *Aquitania* on business of the company.

E. B. Pillsbury, general superintendent, recently visited the high power stations at New Brunswick and Belmar, N. J.

The company has completed the stringing of two additional copper wires on its poles connecting the high power stations at Marion and Chatham, Mass., making a total of eight wires on the poles.

The receiving station at Riverhead, L. I., which will operate in connection with the transmitting station at New York Radio Central, Rocky Point, L. I., is nearly completed, and will be opened for service early in July.

All America Cables

J. L. MERRILL, president of the company, accompanied by his wife and his private secretary, has returned from New Castle on Tyne, England, where he went to witness the launching of the cable steamer *All Americas,* which will soon be placed in the service of the company at New York.

Canadian National Telegraphs

G. D. Perry, vice-president and general manager, Great North Western Telegraph Company, and since February 1st of this year general manager, Canadian National Telegraphs, has been appointed vice-president and general manager, Canadian National Telegraphs, Toronto, as previously announced.

Mr. Perry was born in Whitby, Ont., on April 19th, 1859, commenced his business career in November, 1877, as a clerk in the Standard Bank at Colborne, Ont. After leaving the bank he was appointed cashier of the Credit Valley Railway, Toronto, Ont., from which position he went to the Dominion Telegraph Company as bookkeeper in February, 1881. When the operation of that company was taken over by the Great North Western Telegraph Company in September, 1881, Mr. Perry joined the audit staff and later was appointed chief clerk and traveling auditor. He has thus been with the company continuously since its organization, and has held successively the positions of secretary and auditor, secretary-treasurer and superintendent of supplies, and general manager, being appointed to the latter position in March, 1911, in succession to the late Isaac McMichael.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York. —Advertisement.

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Tired business man, whether hunter or fisherman, can find rest and pleasure at THE LODGE, BALDWIN MILLS, P. Q. A small camp in the woods on one of many lakes. Elevation 1200 ft. One night's ride from New York or Boston. Sleep and eat out of doors, log fires, good food, rough comfort, absolute quiet, number limited. A THREE MONTHS' HUNTING SEASON! OPEN UNTIL CHRISTMAS. References. Address Mrs. M. S. Mitchell, Coaticook, P. Q., Canada, R. F. D. 5.

This advertisement has been copied from one of the well-known newspapers of the day. Many of our readers will remember Mrs. M. S. Mitchell as one of the leading women operators of New York. She was the wife of the late John Mitchell of the Telegraph Bureau of the New York *Herald*. Mrs. Mitchel has established herself in a camp which she owns. She is anxious that those needing rest and outdoor life will take advantage of the opportunity to spend their vacations in this splendid section of the country. The camp is located in the Province of Quebec, only a few miles from the Vermont border. Within the camp grounds there is a lake two miles in length that is alive with the best of fish. Outdoor sports are numerous. Those who have spent their vacations in the manner described have been permanently won over to this form of yearly recreation.—Advertisement.

Wireless Concert Pleases

An audience that may have totalled as many as fifty thousand listened on June 5th to a wireless concert by Miss Stella Lamont, an opera singer, and Signor G. Aldo Randigger, a pianist and composer. The concert was arranged by the recreation bureau of the Red Cross, New York, and the Ship Owners Radio Service, primarily for the soldiers and sailors in Government hospitals and sailors aboard warships along the Atlantic coast, but a general invitation was sent to all stations in a thousand mile radius to cut in.

Miss Lamont sang opera selections and Signor Randigger played some of his own creations.

THE towers and buildings of the wireless station at Barranquilla, Colombia, owned by the British Marconi Wireless Telegraph Company, are now completed, and the arrival of the further equipment is all that is necessary to place the station in operating condition. The site of the station is on high ground about two and a half miles from the business section of Barranquilla.

IN some parts of New Jersey, where telephone equipment is not available, radio telegraphy is resorted to to order supplies from grocery stores. If this thing keeps on, every first-class grocer in the rural districts may maintain a telegraph department as a necessary adjunct to the business.

W. J. FRANCIS, district commercial agent of the Western Union Telegraph Company at Atlanta, Ga., in a recent address before a gathering of business men in that city, told them that by a thorough examination of costs for letter writing, including the time of dictating, the stenographer and office expenses, that the average cost of a telegram is not in excess of that of a letter. The results brought by the telegram, he declared, far exceed those attained by letter, because the telegram naturally calls for immediate attention and prompt reply.

Telephone Dividend Increased

The directors of the American Telephone and Telegraph Company on May 17th declared a regular quarterly dividend of 2¼ per cent., payable July 15th to holders of record June 20th.

This increases the annual rate from 8 to 9 per cent.

D. L. HOWARD, superintendent of the Canadian Pacific Railway Company's Telegraph, Calgary, Alb., Canada, in renewing his subscription, writes: "TELEGRAPH AND TELEPHONE AGE is a very desirable publication, and I look for it regularly."

A MINISTER and a traveling man enjoyed the same name. They lived in a small town. The traveling man had gone to Europe, and on his reaching there cabled "Arrived safely. Heat terrific." In the mean time the clergyman had died and his wife by mistake received the cablegram.

The Baudot Printing Telegraph System

The issue of a second edition of the "Baudot Printing Telegraph System," by H. W. Pendry, is fully justified by the extension of the use of that system in the United States and in Europe, the improvements made in the apparatus, and the general adoption of the first edition as a class manual.

The descriptions and diagrams of somewhat intricate instruments and connections are so clear that it is possible to obtain a good knowledge of the system from the book alone, without the necessity of seeing and using the instruments before the information in the book can be said to have been usefully assimilated.

Of the new matter introduced, the most notable is that treating of the Murray phonic motor and the Gulstad Relay. The chapters on Duplex Baudot and Baudot repeaters has been enlarged. The number of illustrations and diagrams has been increased from 72 to 94. The price of the book is $2.50 per copy, and orders should be addressed to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

A Good Book For a Small Sum

Modern Land and Submarine Telegraphy, by Macomber, price 75 cents per copy, 6 inches by 8½ inches in length, fully illustrated. It is a ninety-page book and is devoted to a brief up-to-date treatise on the electric telegraph, including the development of modern methods and equipment.—Advertisement.

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CONTENTS

Carrier Current Telephony and Telegraphy. By E. H. Colpitts and O. B. Blackwell. (Concluded from page 267, June 16th issue)..... 290

New Stock Purchase Plan for Employees..... 292

Pueblo 'Phone Girls Perform Heroic Duty..... 293

Theory of the Non-Numerical Switch. By Harry E. Hershey. (Continued from page 269, June 16th issue)..... 294

Developments in Practice and Art of Telephotography. By Niklo Tesla. 296

Student's Course in Technical Telegraphy. By Louis Casper. Lesson 30 299

The Old Time Telegrapher. Baudot by Wireless in France..... 301

Editorial—The Difficulties of Conducting Trade Papers Multiply. Market Reports by Radio 302

The Railroad—New Wire Crossing Law in Ohio. Death of E. E. Hudson 305

At What Age Are You Most Fit?..... 306

J. C. Ward Taught Edison Telegraphy..... 307

Personal. Postal Telegraph-Cable Company 308

Western Union Telegraph Company. Telegraph and Telephone Life Insurance Association 309

All America Cables. Canadian. H. R. 5215—United States Military Telegraph Pension Bill. By David Homer Bates. Telephone Society of Boston, Mass. Obituary 311

Radio Corporation of America. Marconi Wireless Telegraph Company of Canada, Ltd. International Radio Telegraph Company. Government Radio Operators Wanted. To Urge Increased Communication With Australia 312

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Carrier Current Telephony and Telegraphy

By E. H. COLPITTS and O. B. BLACKWELL

(*Concluded from page 267, June 16th Issue*)

Line Balancing for Two-Way Operation. As already pointed out, two-way operation may be carried out either by the use of different frequencies in the two directions, or by using the same frequency for the two directions but using duplex balancing arrangements at the terminals. When different frequencies are used in the two directions it is sometimes convenient to employ line balance to supplement the selective circuits.

It will be noted by referring again to the impedance characteristic of a long uniform length of open wire circuit that a balance can be obtained by employing an artificial line consisting simply of a non-inductive resistance of about 600 ohms. Moreover, this resistance gives a good balance for all of the channels employed in a carrier system.

For systems requiring it, balance must be obtained not only at intermediate repeater points, but also at each terminal, since the terminal set is itself inherently a repeater.

There has already been pointed out the manner in which irregularities due to intermediate lengths of cable are cared for by loading. It is important that lines used for carrier operation shall be kept as free as possible from intermediate lengths of cable, lengths of twisted pair, etc. It will be noted that the irregularities in impedance so introduced are similar to those which occur at ordinary telephone frequencies, and were discussed in some detail in the paper on telephone repeaters.

Interference Between Circuits—Transposition. Any general use of carrier systems in the telephone plant requires that it be possible to operate a number of similar systems over the same pole line without mutual interference, that is to transmit the same range of carrier frequencies over a number of circuits running closely together on the same line, with only negligible interference between channels of different carrier systems.

Inasmuch as the only means available for preventing interference between circuits where the same carrier frequency is employed in both directions is that of balance between circuits, effected by transpositions, it is obvious that where a number of carrier systems are to be operated on the same pole line, the circuits must be operated on the metallic and not on the ground return basis. Metallic circuits are also desirable for reducing foreign high-frequency interference, such as "static" and that from high-power radio stations employing frequencies in the carriage range.

The transpositions existing in open-wire telephone circuits are generally inadequate to balance the circuits sufficiently accurately for the higher frequencies of carrier transmission.

As a result of a considerable amount of line measurements of the above types with different transposition systems, and from theoretical investigation of cross-talk at these frequencies, it has been determined that the interference limitations are roughly as follows:

Where carrier systems employ the same frequencies for transmission in the two directions, it would not be practicable to operate systems on all the pairs of a line, since the number of transpositions required would be prohibitively large. In fact, in a lead carrying a considerable number of circuits, the transpositions would have to be more closely spaced than are the poles under present standard construction. It is possible, however, to reduce greatly the effect of interference between circuits, by employing systems using different frequencies in the two directions, and arranging so that all of the systems employ the same range of frequencies in each direction. This reduces, of course, the number of two-way channels which may be obtained per pair. It is not certain, however, that even with this arrangement of carrier systems it would be economical to apply carrier to all pairs of a pole line.

Much has already been accomplished, however, in transposing a limited number of pairs on a pole line for carrier operation, and this constitutes the practical problem in most of the present cases; for example, two carrier telephone systems and one carrier telegraph system are operating over the same pole line in the section of the New York-Chicago line between Harrisburg and Pittsburgh, a distance of about 200 miles. While the circuits involved in this case are not adjacent on the cross-arm, the systems employ the same frequencies for transmission in opposite directions, and therefore represent a severe condition as regards interference.

Noise Interference. As the frequencies used in carrier systems are considerably higher than the harmonics which are generally present in power systems, these circuits are less subject to noise from power interference than are the ordinary telephone circuits. They are not free from such interference, however, since high frequencies may be set up in power systems by the charging of lightning protectors, switching, etc. Since the circuits cannot in general be as well balanced to ground at carrier frequencies as at ordinary telephone frequencies, the carrier channels have shown a certain amount of interference from atmospheric electrical effects—that is, so-called static. Some interference has also been experienced from high-power long-distance radio systems which are now employing frequencies within the same range.

Line-Measuring Apparatus. To put the lines in proper shape for carrier operation and to maintain them properly has necessitated the development of a suitable measuring technique and of portable measuring units, including a high-frequency oscillator, high-frequency impedance bridge, detector circuits, thermo-couples, etc.

A portable high-frequency oscillator designed for

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testing work involves the use of four vacuum tubes and affords stable outputs as high as 500 milliamperes into an average line impedance. Its frequency range extends from 100 cycles to 50 kilocycles, and it is designed to operate on telephone-office power-supply sources.

Attenuation measurements have been carried out largely by the use of thermocouple meter circuits in conjunction with an oscillator of the general type. This permits measuring directly the attenuations of lines up to about 250 miles in length. The current sent into the line is compared with the corresponding received current, with the circuit properly terminated. An over-all accuracy of about 1 per cent. is usually obtained. Current as low as 0.25 milliampere may be read with this method, thus making it possible to measure attenuations involving current ratios up to 1:200, or a line length equivalent to approximately 50 miles of standard cable. For greater lengths of line circuits involving the use of the sensitive detector circuit have been employed using comparison methods.

Impedance measurements are made with the oscillator, bridge and detector circuits.

Commercial Apparatus and Installations

Under this section there is given a description of the apparatus which has been developed for commercial service and of the manner of employing it in actual installations in the Bell Telephone plant. To date there have been developed and put into commercial use, three distinct types of multiplex carrier systems, as follows:

1. A carrier-telephone system in which the carrier is transmitted.
2. A carrier-telephone system in which the carrier is suppressed.
3. A carrier-telegraph system.

There has also been developed a two-way repeater set employing vacuum tubes, and suitable for use with any one of these three systems.

The operation of the high-frequency side of the carrier telegraph system will be clear from a consideration of the simplified telegraph circuit and from what has been said of the operation of the very similar carrier-telephone apparatus. It may be said, however, that the discrimination by tuned circuits between the sending and receiving channels which are of different frequencies is supplemented by a line-balancing arrangement. Referring to the operation of the low-frequency side of the system, it will be seen that the manipulation of the sending operator's key controls the sending relay of the carrier apparatus which in turn impresses the signals on the carrier current. In receiving, a sensitive polar-relay is used, operated by the rectified current, which in turn transmits the signals into the local subscriber's loop in the form of the usual direct-current impulses. In the actual apparatus switches are provided by means of which the sending and receiving channels are associated with a common subscriber-loop for half-duplex operation.

The apparatus for one terminal of one full-duplex carrier telegraph channel is mounted on a self-supporting rack. On the front of the panel is the vacuum tubes, the meters for observing the signaling currents, the sounders and key for monitoring, and the switches associated with the subscriber's loop circuit. The panel at the top is hinged to afford ready access to the apparatus mounted on the back. In the lower compartment are located the tuned circuits, the adjustable condensers of which are visible. Below these are the cylindrical case which contains the sensitive receiving polar-relay.

At the top of the testing unit is the relay and sounder of a regular test-wire which extends along the route taken by the carrier system, a meter for measuring high-frequency line currents and the dials associated with an oscillator for testing purposes. The jacks afford access to circuits of any of the carrier telegraph panels grouped with the test unit.

General Consideration. An important aspect of the carrier developments described is that they have placed the art upon a quantitative basis and enabled carrier installations to be engineered and put into operation in much the same way as is done for regular repeater telephone circuits. The transmission layout of the system is determined from a consideration of data on line characteristics and from the characteristics of the apparatus. In carrying out an installation, a certain amount of preparatory work must usually be done on the lines, including particularly the loading of intermediate sections of cable and transposition work. In the offices, the apparatus is installed in much the same way as are the more usual forms of telephone equipment, taking certain precautions, however, to minimize the lengths of office wiring included in the high-frequency circuits and to avoid crosstalk in the wiring interconnecting the individual apparatus-units. The battery supply-currents for the vacuum tubes are usually furnished from the existing 24-volt telephone batteries and 120-volt Morse batteries.

The grade of service given by carrier circuits, both telephone and telegraph, is as a rule quite up to the high standard which prevail for the long distance circuits of the Bell plant. Not only is it possible to deliver the volume of transmission necessary for enabling the carrier circuits to be greatly extended by the addition of ordinary circuits at the ends, but also the naturalness and intelligibility of transmsision is preserved to a very satisfactory degree.

The carrier telephone channels are terminated in the long-distance switchboards in the usual way. In fact, to the operators such circuits are indistinguishable from the regular long-distance repeatered circuits. The operator rings at the terminals of the connecting circuits in the standard manner, and the signals are automatically relayed over the carrier-telephone channel, so that each carrier-telephone channel is provided from end to end with its own signaling channel. The satisfactory working out of

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such operating features as these has been of much importance in completing the commercial usefulness of carrier-telephone systems.

As has been indicated, the carrier-telegraph systems as well as the carrier-telephone systems, are designed to fit as an integral unit into a comprehensive wire-plant, the relay-circuit arrangements providing for automatic repetition between the carrier channels and the connecting circuits, whether the latter be subscribers' loops or an additional section of long distance circuit. The carrier-telegraph circuits are used in the Bell plant, as are the regular composited-Morse circuits, to furnish leased-wire service. The requirements for this service are particularly exacting as regards continuity and quality. The carrier-telegraph circuits have proved to be very satisfactory in meeting these demands.

Reference was made in the first part of the paper to the fact that the carrier apparatus required for meeting the high standards of operation of a public service communication system is expensive. The technique involved in the art is so fascinating that one may readily lose sight of the more practical matter of costs, but to the engineer, the economics of the situation are all-important, for it avails nothing if it is not possible to accomplish by the new method the same, or better, results than were obtainable with the old, at no greater cost. Carrier-telephone systems—at least in the present state of the art—are economical in a general public service communication system only for use over relatively long distances. Of course, whether carrier can be justified in any given case depends upon factors peculiar to that case; in some instances, for example, it may not be physically possible to provide additional wires over a given toll-line or cable route, in which case the relatively high apparatus-costs may be easily justified. The carrier-telegraph system is also essentially a long-distance proposition, although it is sometimes possible to warrant its use for distances somewhat shorter than in the case of telephone systems.

The authors wish to state that this paper is based largely upon the results of the engineering and research work of a great number of engineers on the staffs of Col. J. J. Carty, vice-president of the American Telephone and Telegraph Company, and of Col. F. B. Jewett, Chief Engineer of the Western Electric Company. They desire particularly to acknowledge their obligations to Messrs. R. V. L. Hartley and Lloyd Espenschied, who, in addition to their very valuable contributions to the development of the art, have rendered special assistance to them in the work of preparing this paper.

A Good Book For a Small Sum

Modern Land and Submarine Telegraphy, by Macomber, price 75 cents per copy, 6 inches by 8½ inches in length, fully illustrated. It is a ninety-page book and is devoted to a brief up-to-date treatise on the electric telegraph, including the development of modern methods and equipment.—Advertisement.

New Stock Purchase Plan for Employees

The American Telephone and Telegraph Company has announced a new plan for subscriptions for the stock of that company by employees of the American Company and Associated Companies of the Bell System, the full details of which are explained in a pamphlet that has been distributed to every employee.

The present plan differs in several vital respects from the first plan, the extension of the first plan, and the second plan. Under the present plan no special time for making subscriptions is specified, but they may be made on or before the last day of any month, payments to begin with the second month following, as specified above.

Applications for stock made before June 10th will be considered as having been made in May, and pay deductions will begin in July.

The plan does not bar employees, who are now finishing the payments under the second plan, from subscribing the full amount of new stock to which they would be entitled, according to their annual rate of pay.

In announcing the inauguration of the new plan President H. B. Thayer of the American Telephone and Telegraph Company said:

"Under the First Stock Purchase Plan and its Extension, 22,155 employees have become stockholders owning 104,781 shares, and under the Second Stock Purchase Plan 41,325 employees are now paying installments which will entitle them to ownership in 174,500 shares.

"As stockholders, you become financially interested in the nation-wide system which is giving telephone service from Maine to California and from Canada to Mexico, to which service you and your fellow employees are giving your life work. You become partners as well as employees.

"Under the former plans, in becoming partners you bought out other partners. By the new plan, authorized by recent legislation, it is now possible for the capital which you furnish to be added to the capital of the company instead of merely replacing the capital of another investor withdrawing from the enterprise. To my mind that adds a new interest. Besides the satisfaction of working to some extent for yourself, with the new plan there is the added satisfaction of helping to provide for the extension of our service. To be a part of the Bell System and to be a part owner, are both things to be proud of."

The new plan provides an opportunity for stockholders to let their dividends apply on the purchase of additional stock.

Why not work side by side with your own dollars? Every time the Bell System makes an extension you have an interest in it. There is not a move made by the company in which you will not have a healthy interest.

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Pueblo 'Phone Girls Perform Heroic Duty

No novelist ever wrote a more heart-gripping story of loyalty of employees to employer and the public than is told in the account of the telephone girls and Byron Thady, night wire chief, in the Pueblo exchange the night of June 3, when the Arkansas river flood devastated the city. The report, made by Mrs. Joseph E. Prior, day chief operator, has been transmitted to John F. Greenawalt, publicity manager of the Mountain States Telephone and Telegraph Company, by A. U. Mayfield of the publicity department, who was sent to Pueblo to investigate telephone conditions.

Mrs. Prior was just being relieved by Miss Margaret Williams, night chief operator, when warnings of the rising river were received, and she threw off her hat and wraps to be one to aid in the direction of the exchange.

Mrs. Prior's report follows:

"When the flood broke, our girls on duty began warning every one they could reach, and when the shrill whistles of the iron works and the church bells rang out the warning to those who might be in danger, every telephone operator in Pueblo in our service, who could get there, waited not for a call, but they said in their heart of hearts, 'That is my job—the company needs me,' and like brave soldiers who went over the top on the battle fields of France.

"Every girl on duty or off duty rushed to the station amidst the downpour of rain and the thundering crash of lightning, many wading in water far unsafe. This was a wonderful proof of loyalty that I watched silently, and, so far as they knew, unnoticed; but in my heart I knew they were performing a wonderful service, and even amidst the moments of disaster I couldn't crowd out the thought that the public we serve can never know what it means to be a telephone operator.

"So it was that we had thirty-nine out of the possible fifty girls in the whole city, on the job. Most of the absent eleven were off on their vacations or ill at home. No one shirked nor stayed away from choice. Byron Thady, night wire chief, was the only man in the building, and like a great, big-hearted brother, he watched over us with gentle and reassuring care.

"By 8 o'clock the flood water began to rise around the building. Every switchboard was occupied and every signal seemed to be alive on the boards. One operator was detailed to warn the rural subscribers farther down the river, while other boards were worked to their capacity by the girls warning people in the lowlands of the city to flee for their lives.

"It wasn't long until calls for help were shrieked into the ears of the operators—homes were being surrounded by restless and threatening waters. Mr. Thady, who was on the test boards in the basement, came to the top of the stairs time and again to speak a word of encouragement. Once when he came up I noticed his trousers were wet to the knees, but he made no reference to the waters that had broken through the basement window and were filling the test room.

"The night grew darker and the roaring thunder seemed to shake the very earth—the gates of the storm-clouds had been lifted and the torrents poured from the skies. Our supervisors walked calmly up and down their positions behind the operators, thus lending a feeling of security and tranquility to the over-strained nerves of the God-inspired angels at the boards.

"Then, like a mighty hand of resistance, darkness swept across the boards and simultaneously every signal died away and all was in darkness. The waters had cut off the connections. Mr. Thady came staggering up the steps—his clothes were soaked and his hair was disheveled—a sort of calm fear was upon his face.

"'Mrs. Prior, you might as well take the girls up on the third floor, I guess,' he whispered to me, 'it will be more comfortable for them up there, I think.' There was no more for them to do—the flood had filled the basement and the work of warning was ended—they had done their duty, and no one will ever know how many lives they saved.

"So we took the tired girls upstairs. They looked out of the windows, and all about was a sea of turbulent waters. They could see the dark waves rise higher and higher, with floating objects tumbling and plunging. Houses, barns and sheds came along, and, worst of all, struggling forms of men, women and children—cattle and horses, all added to the terrible scene that was ever sweeping before their eyes.

"For a while we had forgotten Mr. Thady—he was on the first floor struggling with the in-rushing waters that rose fast and threatening. Finally, he came to where we were; he carried a card case—it was the subscribers' cards and the trouble records. Before I could say a word to persuade him to give up his task of service, he plunged back down the dark stairway—for all the lights were now out—and was gone. It was only a minute or two, although it seemed like hours, until he came back up the steps carrying the cable records—the most important documents in all the company's records. The expression on his face told me he had had a terrible struggle.

"'Well, I got the records, anyway,' was all he said; and then, wiping the dripping, muddy water from his face, added, 'How are the girls?'

"I afterwards learned that he had gone into the room where the records were and that the on-rushing waters that came through the broken windows had closed the door behind him, cutting off his only possible way of escape. The water rose higher and higher about him until it came to his armpits, then it crept up and up like a slimy, damp chill of death until his head was barely above the water. He tugged at the door, but the weight and force of the torrent was against it; then, like the hand of Providence reaching out into the night he

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felt something scraping his hand. It was a strong piece of board. He pushed upon the door and forced the board into the opening; slowly he squeezed through the crevice and plowed his way against the flood until he reached the stairway leading to the second floor. And during all this struggle he held firmly to the cable records, bringing them safely out of the destroying flood.

"By this time the water had reached a depth of about twelve or fourten feet in the streets and was still rising rapidly. We observed that it raised five steps on our stairway in fifteen minutes. The whole city seemed to be in the midst of a terrible sea. The entire block of buildings across the street in front of our building washed away, and the houses and store buildings were mostly brick. One frame house came tearing along, headed directly for our building.

"Miss Williams, Mr. Thady and myself hurriedly held a consultation. We decided that the hour had come, but we said nothing to the girls. The rolling structure came on with irresistible force, and then —a crash! It had plowed into our garage like a mighty tank on the field of battle. The building rode over the garage as if it were but a nodding reed, then it came directly toward our building. Some of the girls knelt in silent prayer, others covered their faces with their hands, but none shrieked or cried aloud. They were calm, orderly and ready —yes, ready for the end. It was a terrible moment of anxiety. Then something happened, all in the twinkling of an eye! The black monster that would have torn a hole in our building swerved and toppled to the north as if shoved aside by an unseen hand. It rolled past over our building and we were saved! This all happened in much less time than it has taken me to tell the story—but it seemed ages!

"We heard a man near by crying for help. He was near our east windows. Mr. Thady opened the door to the fire escape. Across the alley, on top of a one-story garage, we saw him. He had in some way cut a hole through the roof and crawled up out of the water. We saw the face of another man peer through the hole in the flat room, but only for a moment. Then it dropped back into the splashing waters and was seen no more. Mr. Thady shoved a floating plank to the man on the roof and he was dragged into the second story of the telephone building.

"We did everything we could to keep the girls in calm spirits. We played the Victrola almost constantly—it had a quieting effect on the girls. When morning came rescue boats came to our building at 6 o'clock and we were all taken out and landed on an isle of mud, hoping to be able to get off and to our homes, but the water was too high and from 6 in the morning until 3 o'clock in the afternoon we stood in the mud and water without drink or food, waiting our turn to be taken ashore."

Theory of the Non-Numerical Switch

By Harry E. Hershey,
Of the Automatic Electric Co., Chicago

(*Continued from page 269, June 16th Issue*)

In our previous discussions we have confined ourselves to a one hundred line system in which each line has an individual connector. With each connector of the hundred is associated a line and private bank. The contacts of these banks are multipled, i. e., no matter what connector is used, if it is stepped one up and one in it will ring telephone number 11.

A connector is a more or less complicated machine and as the saying is, "it costs money," the fact is that it costs so much money that a system such as we have been discussing could not be commercially operated, due to the excessive cost of equipping each line with one of these complicated connectors. Fortunately, each line is not in use all the time, therefore we can arrange a scheme of this kind: We will provide but ten connectors, the

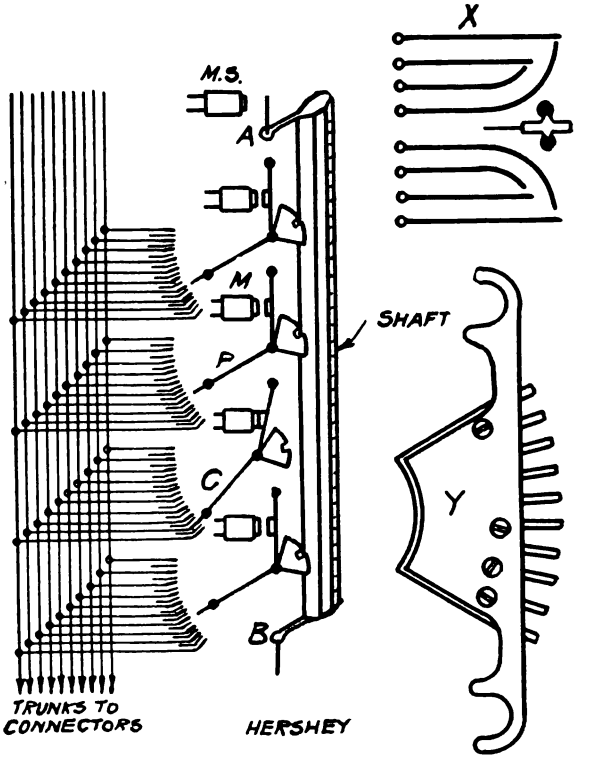

Fig. 17—Line Switch Scheme

banks of which will be multipled so that each connector has access to each and every line in the hundred. Each line will now terminate on what is termed a non-numerical switch. Whenever a subscriber removes his receiver this non-numerical switch causes his line to be extended to an idle connector in the group of ten, after which the connection is completed in the manner with which we are already familiar.

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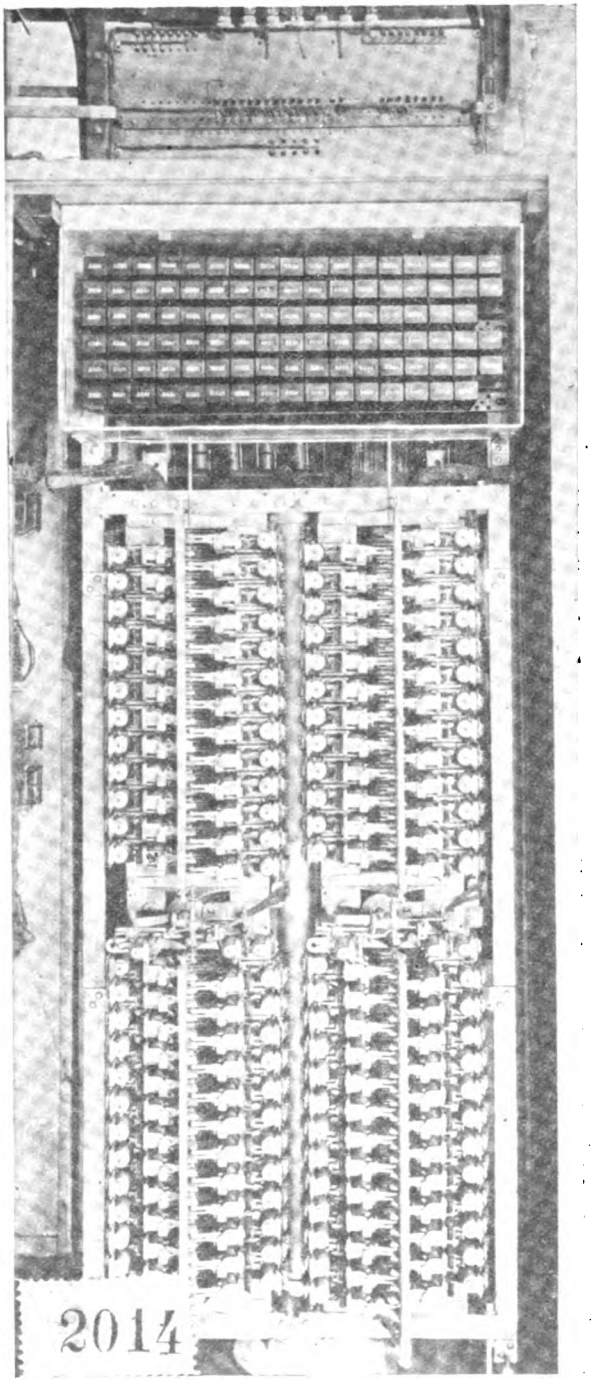
The Keith Line Switch

The Keith Line Switch is the most successful form of non-numerical switch. The economy incident to the use of the Kieth Line Switch was probably the determining factor which made Automatic Telephony a commercial possibility.

Referring to Fig. 17 we find that the trunks to the ten connectors have been arranged in the arc of a circle. The Keith line switch consists of a magnet M and a plunger P, the head or wing of this plunger is slotted so that it may engage a projecting edge of the shaft. The shaft is pivoted at the points A and B and is capable of an oscillatory motion through about 40 degrees, under the control of the master switch M. S. This motion of the shaft causes the plungers of the various line switches to swing back and forth in front of the terminals of the trunks to the connectors. The master switch so controls the shaft that it will only come to rest opposite an idle trunk. Let us assume that the shaft is holding all the plungers opposite the second trunk, if a subscriber removes his receiver the corresponding line switch will "plunge in" and extend the connection to the connector associated with trunk number two. The line switch which "plunged in" is now free of the shaft, as may be seen at C. The master switch immediately, by means of the shaft, moves the remaining line switches opposite an idle trunk, thus we have what is termed the "pre-selection of trunks." When the subscriber, who plunged in on trunk number two, restores his receiver to the switch-hook his line switch will "come out" of the bank, but the slot in the wing of the plunger will not engage the shaft at this time. Therefore this particular line switch will remain opposite trunk number two until such time as the shaft again swings in front of this trunk and "picks it up." It is essential that a line switch must not "plunge in" during the time that the master switch is seeking an idle trunk, for if it did, the calling party would get in on a busy line. This is taken care of by what is termed the "open main" battery feed.

Each line switch is provided with a line switch bank into which it "plunges." This bank consists of a set of springs for each trunk, as shown at X. As the standard bank is made up of ten trunks, it will therefore contain 80 springs. A sketch showing the complete bank will be found at Y. With reference to X, it may be said that the straight springs are really not springs at all, but pieces of stiff brass; the curved springs are made of a special spring bronze and are of about the thickness and width of the reeds in the ordinary mouth harp. When a plunger enters the bank it causes the curved springs to first move over against the heavy springs, and then to partially straighten out, thus producing a rubbing effect which results in a more reliable contact than is obtained by using the ordinary platinum points. Each curved spring is multipled with the corresponding spring in each trunk; the fact is the ten corresponding springs are all formed from the same piece of bronze.



Line Switchboard as Manufactured by the Automatic Electric Company

Questions

A. Why is a line switch termed a non-numerical switch?

B. Given that connectors cost $25.00 each and that

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line switches cost $60.00 each, what saving is made by using line switches in a one hundred line system employing ten per cent. trunking?

C. How would you express the relative seriousness of the following cases of trouble? Line switch out of service. Connector out of service. Master switch out of service.

D. What would be the condition of the master switch immediately following the removal of the tenth receiver, assuming that none of the preceding nine had been restored to the switch hook?

E. If in ten per cent. trunking, ten subscribers were already calling out, what would happen if an eleventh party attempted to call?

Note: Fifty line switches are mounted on the left-hand section, and fifty on the right-hand section. Midway of each section will be seen a master switch which operates the shaft, controlling the associated fifty line switches.

(*To be continued*)

The Baudot Printing Telegraph System

The issue of a second edition of the "Baudot Printing Telegraph System," by H. W. Pendry, is fully justified by the extension of the use of that system in the United States and in Europe, the improvements made in the apparatus, and the general adoption of the first edition as a class manual.

The descriptions and diagrams of somewhat intricate instruments and connections are so clear that it is possible to obtain a good knowledge of the system from the book alone, without the necessity of seeing and using the instruments before the information in the book can be said to have been usefully assimilated.

Of the new matter introduced, the most notable is that treating of the Murray phonic motor and the Gulstad Relay. The chapters on Duplex Baudot and Baudot repeaters has been enlarged. The number of illustrations and diagrams has been increased from 72 to 94. The price of the book is $2.50 per copy, and orders should be addressed to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

A Knowledge of Phillips' Code an Asset to the Telegrapher

Phillips' Code, *Latest Edition,* a thoroughly tested code of abbreviations, arranged for telegraphic purposes and contemplating the rapid transmission of press reports; also widely used as an easily acquired method of shorthand. Revised and brought up to date, with supplement to February, 1920. The new edition contains about 700 additions to the older code, and is indispensable to the operator who aspires to the standard of proficiency required by press associations, which includes a knowledge of Phillips' Code. Flexible cover, vest pocket size, $1.25 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

Developments in Practice and Art of Telephotography

By NIKOLA TESLA

The recent successful experiment by Edouard Belin, of Paris, in the transmission of photographs between New York City and St. Louis, a distance of 1,000 miles, have naturally aroused a new interest in this rather old art. Mr. Belin's apparatus has been examined with a knowledge of previous efforts in that direction, and it must be admitted that the French inventor has achieved a marked improvement. It is true that his apparatus in many of its features is old and well known, but all the details have been worked out skilfully and his photographic reproductions are not only good likenesses of the originals, but are expressive in no small degree. In common with other arts, the transmission of pictures to a distance has been brought to its present state of perfection by slow and gradual improvements effected in the course of seventy-seven years. The literature on the subject is quite voluminous and difficult to peruse, as the articles are published in various languages and scattered through numerous periodicals. Only one complete and exhaustive work has been published in German, by Dr. Arthur Korn, of Munich, and Dr. Bruno Glatzel.

FIRST PATENTS TAKEN OUT MANY YEARS AGO

The original idea is due to Alexander Bain, a Scotch mechanician, who secured a British patent disclosing the invention in 1843. His plan contemplated the transmission of printed letters, drawings and pictures in the following way: At the sending station a holder with insulated metal points was arranged to glide in the direction of the lines over a frame resting on the printed page to be reproduced at a distance. Within this frame, and at right angles to its plane, a number of short wires were imbedded in sealing wax, their lower ends being in contact with the letters, which in turn were all electrically connected. As the holder moved back and forth the insulated metal points would be brought in and out of contact with the upper ends of the short wires, thus controlling the flow of the current through them. Each metal point was joined by a special line to the receiving station, where there was a similar holder made to slide over chemically prepared paper laid on a grounded metal plate. When a battery at the transmitting end was connected with one of its poles to the letters and the other to the ground the current impulses tranversing the line wires and the chemical paper would cause changes of color in the latter, thus reproducing the characters. A great number of points and line wires were required to attain satisfactory results, and, realizing this objection, Bain proposed to avail himself of only one wire, but did not give full information in this regard. Subsequently, Bonnelli and other inventors made improvements in his apparatus, reducing the number of wires to a few. There is no doubt that, despite the manifest crudity

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of this system, it was quite capable of being used commercially in the transmission of type as well as drawings and pictures, and may yet be found available.

The first practical success was achieved by an Englishman, Frederick Collier Bakewell, who secured a British patent in 1847 on a process, some features of which have proved to be indispensable in later years. He employed as a transmitter a cylinder on which the characters were written with insulating ink. A metal point bore on the cylinder and advanced slightly with each revolution of the same exactly as in the older form of phonograph. A similar cylinder covered with chemical paper and equipped with a sliding point was provided at the receiving station. The cylinder being grounded and a battery included in the line wire connecting the transmitting and receiving points, the passage of the current resulted in a discoloration of the paper and reproduction of the written characters at the receiving end. Considering the period Bakewell's apparatus was surprisingly perfect, particularly in the feature of maintaining the rotating cylinders in synchronism, for which purpose he provided an automatic as well as a hand correction. A controversy was waged between Bakewell and Bain for the honor of priority, but in this respect there can be no mistake. Bain was the originator of the idea, while Bakewell was the first to carry it out successfully.

Use of Chemical Paper Considered Impractical

The use of chemical paper was considered objectionable, and in 1851 Hipp eliminated it, producing the impressions at the receiver with a magnet actuated by the transmitted impulses. It is curious, though, to observe that the modern art depends entirely upon this very device. In 1855 Casselli modified the Bakewell apparatus by employing carefully synchronized pendulums at the transmitting and receiving stations, thus replacing the rotary motion by a to-and-fro movement as in the Bain arrangements. Casselli seems to have had more enterprise than his predecessors, and the apparatus which he perfected in 1860 was actually used with some success for a short time in service between Paris and several other cities in France. Its abandonment was probably due to the slowness of transmission and lack of demand for this kind of facility. It is singular that many treatises on physics and other text books mention Casselli while ignoring Bain and Bakewell.

Shortly after this Meyer perfected a system which was used with success in France, and may be fairly considered as the first thoroughly practical application of ideas in this field. A curious improvement was made by Gerard who, in 1865, proposed the use of flat discs in place of the cylinders of Bakewell. Ever since one wire was adopted for the transmission it became an imperative necescity to maintain perfect synchronism between the transmitter and receiver, and many inventors devoted their energy to this task. D'Arlincourt resorted to tuning forks, and his idea was subsequently carried out in a more perfect manner by Lacour. At about this time the invention reached America, and in 1870 Sawyer brought his ingenuity to bear on the evolution of a process in which he employed zinc cliches. These were very reliable and constituted a signal advance.

In 1880 Edison devised an apparatus on the principle of that used by Sawyer, except that the impressions were produced on paper in bas-relief. The idea was carried further by Dennison in instruments of the reciprocating type. Through the introduction of the Tesla alternating system of power transmission a novel means was afforded for operating transmitters and receivers. The use of synchronous motors was proposed first in 1893 by Sheehy.

Developments Permit Use of Photographic Films

In all cases without exception it was necessary to provide an actual print, drawing or sketch to be transmitted until Lenoir introduced photographic films into the art, making possible the transmission of any kind of picture. This was a great step forward, but the honor of the first practical success belongs to an American engineer, N. Amstutz, who used photographic sending cliches in relief for the first time and with complete success. Amstutz was a true pioneer and his improvement is essential in the carrying out of the modern processes. It is true that as early as 1865 a Frenchman, Hubert, had suggested the use of letters written with thick ink, but this was of little value, and Amstutz was undoubtedly the first to produce and use the cliches on which the up-to-date art vitally depends. Perfectly satisfactory demonstrations were made with his devices in this country more than twenty years ago, when pictures were transmitted over telegraph wires to great distances. Samples of his work have been preserved which clearly show how much he was ahead of his time.

Following Amstutz, Dunlany, Palmer, Mills and other American inventors took up picture transmission with more or less success. By this time the necessity presented itself for increasing the rapidity of the process by greater speed of the devices as well as multiplex transmission. The Belgian inventor, Carbonelle, made an important improvement in this direction when he introduced the telephone diaphragm carrying a stylus for making the impressions.

Of all inventors, however, Dr. Korn was the most successful as well as prolific in the suggestion of improvements, his photographic method of recording carried out in 1903 being the most significant. The general idea of photographic recording had been already advanced by George Little, and a few years later Dillon took out a patent involving the use of sensitized paper and a mirror reflecting a beam of light on the same. But it is obvious that at that time it would have been hardly practicable

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to use this suggestion, as photography was not sufficiently advanced. In illustration of this it may be mentioned that in 1892 the attention of the scientific world was directed to a wonderfully sensitive receiver, consisting of an electron stream maintained in a delicately balanced condition in a vacuum bulb, by means of which it was proposed to use photography in the transmission of telegraphic and telephonic messages through the Atlantic cables, and later also by wireless. This proposal was met by insurmountable objections to the photographic method. Indeed, the Belin process has been rendered possible largely through the great improvements in the sensitive films which have been evolved in response to the urgent demands of the motion picture and also under the stimulus of the recent war.

Selenium Cell and Vacuum Tube Used to Transmit and Receive

In the apparatus invented by Dr. Korn a selenium cell is used at the transmitter to vary the intensity of the sending current, and at the receiving station he employs a vacuum tube of high intensity which throws its light through a fine slot on a sensitive plate. The tube is excited by high-frequency currents supplied from a Tesla transformer and may be flashed up many thousand times per second. The motion of the receiver element is effected either by a wire galvanometer, oscillograph or telephone diaphragm. The Korn system has been used for some years past with success in Germany and other countries. In fact, it has been operated for some time even by wireless. Patents on this mode of transmission have been granted in 1898 and 1899 to Kuster and G. Williams, but the arrangements involved the employment of Hertz waves and were impracticable. Later Frederick Braun, Pansa and Knudsen secured patents which, however, are equally defective. Success in this direction has been achieved so far only by Korn, Borjonneau and T. Baker. Invariably the inventors employ a wire galvanometer which is especially suitable for great speed. Telautographic transmission by similar means through wires as well as wireless is now common and is effected by employing a transmitter of two components, the original idea of which is due to an Englishman, Jones, who made that suggestion as early as 1855.

Present Developments Involve Many Old Principles

To this short story of picture transmission Belin has contributed the latest chapter. The process he has finally adopted after many years of persistent effort involves the use of two cylinders rotating in synchronism—one for transmitting and the other for reproducing. The former is of copper and is prepared for opeartion by having its surface coated with a thin shellac solution, wrapping a carbon print of the photograph about it with its face to the cylinder and immersing the whole in hot water, this causing the gelatine to adhere to the cylinder surface in proportion to the degree of blackness so that a likeness of the print in bas-relief is obtained. On this cylinder bears the stylus of a microphone diaphragm which is slowly moved forward by the revolution of the cylinder as in a phonograph. In this manner the pressure of the carbon contacts is varied in conformity with the changes of the surface, and the microphone currents pass over the transmitting wire to the receiving station, where they cause corresponding deflections of a mirror forming part of a highly sensitive dead-beat oscillograph. A strong beam of light reflected from the mirror traverses a screen graduated from full transparency to opacity and is led through a microscopic opening to the sensitive film wrapped around the receiving cylinder. Special provisions are made to keep the cylinders exactly in step, as this is indispensable to good performance. The film is, of course, protected against the external light, and when the operation is completed it is developed as usual so that either a positive or negative print is obtained according to the position of the screen. There is nothing in his apparatus which is fundamentally novel; in fact, every feature of the same has been disclosed in the prior art. Even the graduated screen, which is one of the most essential parts, has been employed before by Dr. Korn. But Mr. Belin has displayed considerable ingenuity and skill in the details, and his reproduced photographs are most excellent. There is every reason to believe that his efforts will be rewarded by an extensive practical application of his devices.

Television to Be Next Step in Progress of Transmission

The transmission of photographs constitutes only the first step toward the immeasurably greater achievement of television. By this is meant instantaneous transmission of visual impressions to any distance by wire or wireless. It is a subject to which I have devoted more than twenty-five years of close study. Two of the impediments which years ago seemed insurmountable have been successfully overcome, but great difficulties are still in the way. These are encountered in the inertia of the sensitive cells and the enormous speed required to make possible the vision of persons, objects or scenes as in life. It is the problem of constructing a transmitter analogous to the lens and retina of the eye, providing a medium of conveyance corresponding to the optic nerve, and a receiver organized similarly to the brain. It is a gigantic task, but I am confident that the world will witness its actual accomplishment in the near future.—*Electrical Review.*

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY.

By Louis Casper.

Lesson 30

Self Induction

It is a familiar fact that all bodies, some more, some less, offer a certain opposition to the transfer of electric energy from place to place, and at the same time readily absorb upon their surfaces currents from other bodies, which are likewise engaged in transferring such electric energy as has been impressed upon them. These peculiar phenomena are particularly important in the consideration of the transmission of telegraph signals over distances of magnitude. It is found that when an electric current traverses a conductor, it, in some mysterious manner creates what is termed a "magnetic field"

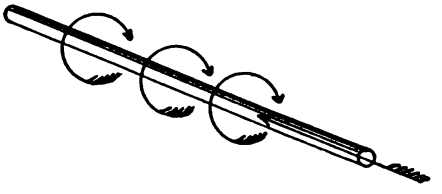

FIG. 77

around the conductor. As long as the current traverses the wire, the space about the latter possesses to a more or less degree exactly the same properties as are exhibited by a permanent magnet.

The intensity of the field thus created depends on the amount of electricity passing, and the shape of the conductor.

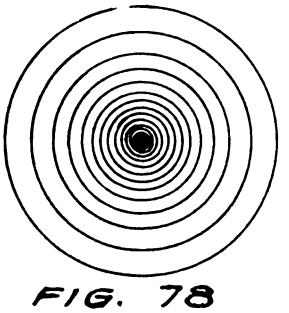

FIG. 78

Fig. 77 shows a straight piece of wire in which there is a current, its direction being indicated by the arrow. This current will surround itself with lines of force whose direction, with reference to the direction of the current, will always be as shown in the figure. If the current be reversed in direction, the lines of force will also be reversed. These lines of force as they arise spring outward from the center of the wire (Fig. 78) and in so doing "cut" the wire, giving rise to an e.m.f.

Whenever the lines attain a steady value—i. e., neither increased or diminished—there is no further "cutting" and no further e.m.f. is generated. When the current begins to diminish in value, the lines collapse, again "cutting" the wire and producing an e. m. f. in the opposite direction. This effect is known as the electro-motive force of self-induction and is always as stated opposed to the direction of the electro-motive force impressed on the circuit. The regular current, in increasing, causes more

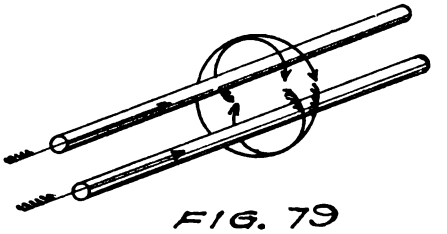

FIG. 79

lines of magnetic induction to be inserted in its circuit, and thus creates *during the period of increase* an electro-motive force equal at any instant to its own rate of increase and opposed in direction to the electro-motive force impelling the current.

Any circuit traversed by a current encloses within the space bounded by the conductor a certain number of lines of induction, the number depending upon the strength of the current; and if we assume the circuit to be wholly removed from all foreign currents exteriorally and omitting all magnets, the total inductance (number of lines of induction) through the circuit, for a unit current flowing in it, would be termed the *co-efficient of self-induction.*

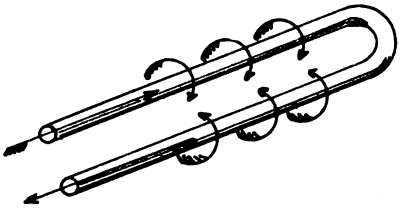

FIG. 80

Mutual Induction

The lines of induction through any circuit in which current is flowing, are always closed upon themselves, and form rings or loops. The exact form of the loop depends upon what is going on in the space outside the circuit, and upon the magnetic properties of the medium through which it passes; but every loop of induction must surround the current which causes its existence. If, then, we imagine a second circuit placed near the first, some of these loops, in passing around through space, will be threaded or "cut" through the area enclosed by the second circuit. Hence, if any change takes place in the current flowing in the first circuit, it will cause contraction or expansion of the loops of induction, and therefore a change in the number of lines of induction passing through the second circuit. This phenomenon is called mutual induction.

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If two wires carrying currents in the same direction be placed close together, the lines will form a continuous loop and encircle the two wires as shown in Fig. 79.

The lines tending to encircle each wire will oppose those about the other between the wires and thus force each set of lines of induction to widen out and form loops around both conductors. This will cause the current in each of the wires to inductively attract each other.

If two wires are laid side by side as in Fig. 80 and the currents in them be in opposite directions, the lines of induction from each wire will oppose those of the other and there will be no counter-induction. For this reason in all alternating current work, wires of opposite polarity are brought as close together as possible, and in telephone work they are twisted closely together. Wires placed in this manner will cause the currents in their respective circuits to inductively separate from each other.

If a wire in which there is a (Fig. 81) current be placed near another wire forming a closed circuit, the lines of force about the first wire will "cut" the second and will induce currents in that wire. This induction will only take place while the lines are changing in number. The current induced in the loop will, however, be in the opposite direction to the inducing current and the lines created by it will oppose those of the other, and thus lessen the self-induction of the original circuit.

Co-Efficient of Mutual Induction

If, now, we go a step further, and imagine that an electro-motive force is originally impressed on a (Fig. 82) circuit and another electro-motive force is impressed on a second circuit the following condition of affairs will exist: Let us call the first and second circuits A and B, respectively. The circuit

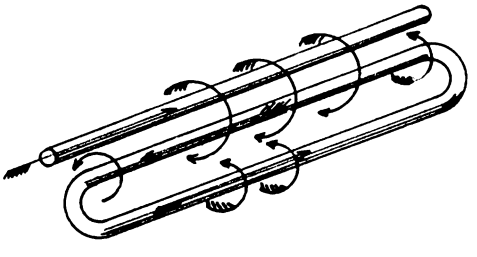

FIG. 81

A will have its system of loops of induction, some of which pass through the circuit B, and the circuit B will have its system of loops of induction, some of which pass through circuit A. There will then be a bundle of loops of induction which are linked with both A and B; and the number of lines of induction so linked will depend on the current flowing in each circuit, and the position of one circuit with respect to the other. If we assume the two circuits to be wholly removed from all other foreign currents and magnetic material and a unit current is passing in each, the resultant number of loops of induction linked with both circuits is the *co-efficient of mutual induction* for those circuits in their given relative positions.

Evidently, the co-efficient of mutual induction will change with every change in the relative positions of the two circuits. If one circuit is in the plane containing a loop of induction due to another circuit, then no lines belonging to the A system will pass through B, and no lines of the B system will

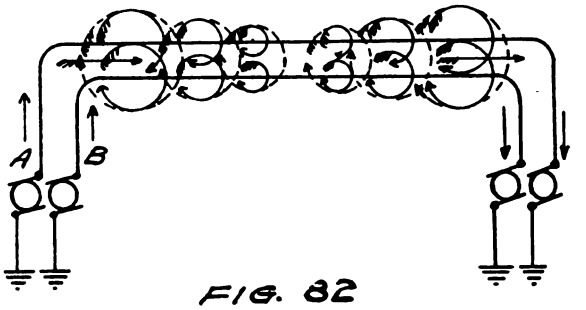

FIG. 82

pass through A. In this case, the co-efficient of mutual induction is zero, and a change in the current in one circuit will have no effect upon the other.

Note.—The terms "lines of induction" and "loops of induction" are merely a help to the imagination in forming conceptions of the state of things we are considering. It must not be understood that they are actual lines; but, by speaking the number of lines through a given surface, we are able to visualize a clear and actual image of the intensity of a phase of inductance through that surface. In a similar sense, lines of force of any other kind are spoken of in various text books.

In Lesson 29 the formula for calculating the reactance x should read—

$$x = 2\pi f L - \frac{1}{2\pi f c}$$

(To be continued)

New Edition of Beginner's Manual of Submarine Cable Testing and Working, by G. M. Baines, Now Ready

Beginner's Manual of Submarine Cable Testing and Working, by G. M. Baines, has been thoroughly revised by its author and it was issued in fourth edition form on June 1st. The book is primarily for students in submarine telegraphy. All of the subjects on submarine telegraphy demanding attention have been brought within the scope of this volume, and have been dealt with, if not exhaustively at least at sufficient length to enable an intelligible idea to be obtained of them, which will admit of wider extension later. The book measures 5½ inches wide by 8½ inches long and contains 174 pages fully illustrated. The price of the work is $4.50 per copy, and it may be obtained at the office of Telegraph and Telephone Age, 253 Broadway, New York.—Advertisement.

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The Old Time Telegrapher

L. H. McFarlane, president of the Bell Telephone Company of Canada, and an old-time telegrapher of Montreal, Quebec, in a speech made before the Old Time Telegraphers' and Historical Association at its reunion in Toronto last fall, had this to say:

"At our reunion in Montreal in 1901 the name of our Association was changed from "The Old Time Telegraphers' Association" to "The Old Time Telegraphers' and Historical Association." The object was to preserve a historical record of the early days of telegraphy.

It would seem fitting that one subject that we should record is the Old Time Telegrapher himself. We can do so, and leave behind a picture of him, as we know him, and I will attempt this brief sketch of his career.

In the middle and third quarter of last century he was at his best. To the public he was a mysterious person, dealing in something uncanny, was looked up to and respected in the community as a magician or something akin thereto. I speak now of the *real* Old Timer in days when one wire only connected the various cities of importance, and all messages had to be relayed for distances over three or four hundred miles. Usually he graduated from the messenger service, and in his teens became a first-class operator, with all the responsibilities and the wages of a full-grown man; mayhap in charge of a village or town office of considerable size, and having others under his charge. Thus at an early age he had more money to spend than his fellows; is it, therefore, strange that some of the boys should have lost their heads and gone wrong, becoming tramp operators and drifting about through America—a job always awaiting them which they could never keep because of wanderlust and conviviality.

Unions were unknown, and wages though low and working hours though long, were a secondary consideration to most operators. To contrast wages and hours with today's standard could bring only one answer, and that is they must have worked for the pure love of the work and because of pride and loyalty to their company.

To belong to the Telegraph Fraternity then meant many privileges and perquisites unheard of today. Besides the standing it gave one, wherever an operator went, there was the fascination of free travel; D. H. transportation on the railways was to be had merely for the asking, and, in many cases free steamboat rides with free meals and berths included—in consideration of reporting free the arrival and departure of boats passing their towns. Free parcels by express, and in many cases free board and lodgings at hotels when traveling were also the Old Timers' portion.

Those who are not real Old Timers will ask how was this possible. Well, there was no Interstate Commission or laws to interfere. Telegraph companies exchanged free privileges with railway, express, steamboat companies and hotels, and the officials of these companies always seemed most anxious to stand well with the telegraph operator.

Many skilled telegraphers drifted out of the craft in the early days, after acquiring the best business training it was possible to acquire. There was, as you know, no place where one could learn so much in so short a time, and the telegraph office might be termed the "Business University of America." Possibly this drift into other lines was accelerated upon the advent of the technical press, which, in the absence of matter to fill their pages, repeatedly quoted certain discouraging articles which took the pleasure out of their young lives. Oft published items were that the Government were about to take over the telegraph business; that girls would shortly supplant operators; that printing or automatic telegraphs were about to displace all operators; and most discouraging of all that lung troubles among operators was increasing to an alarming extent because of their posture over a table for long hours.

The total lack of supervisory officials or close supervision in the early days gave the operator greater initiative and responsibility, bringing out splendid and sterling qualities in early life and thereby furnishing the public with a service fairly comparable with that of the present day, notwithstanding the crude machinery and poor lines with which he had to serve. He overcame many difficulties, and met success. Let us honor his memory as the "Upbuilder of Telegraphy" who laid the cornerstone of our craft."

Baudot by Wireless in France

Before the French Academy of Science on May 9th a radio development of the Baudot System was described by Professor Lippmann by which in recent trials over 7,000 words were sent and correctly received by one set of wireless transmission and reception instruments.

The new invention is the work of two electrical experts, MM. Abrahams and Planiol, who have succeeded in adapting for use by wireless the Baudot System, which is used over wire. By this system several messages can be sent at the same time over the same wire.

The instruments used in the wireless trials were practically the same as those used for ordinary telegraph purposes. The dispatch was from a Baudot apparatus and was received by a Baudot automatic printing apparatus, the fact that Hertizian waves were used instead of telegraph wires or cables. The messages were typed out separately by the receiving instrument in the ordinary way.

Instead of each message having to be sent separately, a whole series can be sent at the same time by the new method, with an immense saving in the time of transmission by operators.

The committee of experts who saw the trials declared themslves completely satisfied, and orders have been given to install the instruments to relieve the French land wire congestion.

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EDITORIAL COMMENT

The Difficulties of Conducting Trade Papers Multiply

On July 1st the zone rate of postage was increased to ten cents per pound covering the eighth zone. The eighth zone is that portion of the United States west of Nebraska and is the section of the country in which we have the greatest number of subscribers. We formerly paid one cent per pound second class postage covering the entire United States. This drastic zone law has forced many publications to go out of business, as the postage rate is exorbitant and is higher than the postage on the papers of subscribers in foreign countries.

The Postmaster General has also notified all publications that hereafter everything that bears the resemblance of advertising that appears in their reading columns, whether paid for or not, must be plainly marked with the word "Advertisement," spelled out in full in every instance under heavy penalty.

The Postal Laws and Regulations, paragraph 2, section 443, reads as follows: "All editorial or other reading matter published in any such newspaper, magazine, or periodical for the publication of which money or other valuable consideration is paid, accepted or promised, shall be plainly marked 'Advertisement.' Any editor or publisher printing editorial or other reading matter for which compensation is paid, accepted or promised, without so marking the same, shall upon conviction in any court having jurisdiction, be fined not less than fifty dollars ($50) nor more than five hundred dollars ($500)."

Congress in its infinite wisdom and judgment is enacting laws that is making it difficult for newspapers and trade publications to exist. What we need in this country is one zone system and not eight. The subscribers who happen to live in high zones have to pay a penalty in the shape of excess postage on printed matter. However, in spite of all these handicaps, TELEGRAPH AND TELEPHONE AGE is one of the few papers that have not found it necessary to increase its subscription rates, no matter in what section of the country its subscribers reside, and it has no inclination of following the example of other trade papers in this respect by increasing its subscription rates.

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IT is stated by authorities in England that by the institution of a system of non-urgent telegrams to correspond with deferred telegrams in the United States, a considerable revenue would result. The increase in the telegraph rates to one shilling for twelve words, including address and signature, has resulted in a large number of people in England ceasing to use the telegraph for messages that are not really urgent.

International Communications Conference

Forty experts, representing the United States, Great Britain, France, Italy and Japan, met in Paris, France, on June 21st, for a prolonged conference on the question of world wireless communication. The purpose of the conference is to harmonize the radio rules of the world and formulate plans for bringing wireless into more general use through the encouragement of private enterprise under government control.

The American Government has sent a delegation of ten of its best military and civil experts, headed by Major-General George O. Squier, chief of the Signal Service of the United States Army.

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Market Reports by Radio

A system of broadcasting agricultural reports throughout the greater part of the country by wireless was established June 20, when the Post Office Department wireless stations at North Platte, Neb.; Rock Springs, Wyo., and Elko, Nev., were included in the radio market news service of the Federal Bureau of Markets. Agricultural market reports on live stock and meats, grain and potatoes in important national markets have been dispatched daily since April 15 from Post Office Department wireless stations at St. Louis, Omaha and Washington, D. C., and the proposed expansion is due to the successful operation of the service at these points The Bureau of Markets also arranged recently to broadcast market reports from Pittsburgh by radiophone.

For the first time in the history of the country it is possible, by means of the department's radio service, for farmers to keep informed of national agricultural market conditions the same day that business is transacted. Formerly the growers in many sections, now to be covered with the radio news, received their national market news several days late.

An ideal situation, say Bureau of Market officials, would be the establishment of one or more official receiving and distributing points in each county or group of counties covered.

Farmers everywhere are reported to be most enthusiastic over the new service. It is expected that the placing of market news in the hands of the farmers shortly after the close of the markets, and during the day's business, will help materially to regulate the movement of farm products to meet the demand, and condition precedent to the stabilization and equalization of prices of farm products.

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THE ARLINGTON Radio Station was badly damaged by lightning on June 26th, and will be out of commission for several days.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.

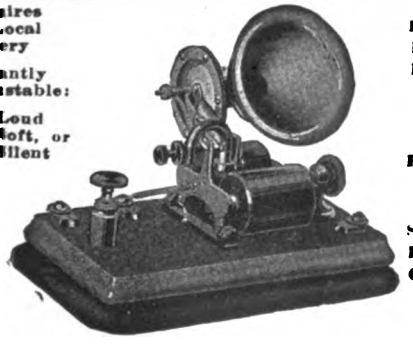
1205 Hobart Bldg., San Francisco, Cal.

2044 Railway Exchange Bldg., St. Louis, Missouri.

DIAPHRAGM *Telegraph Sounder*

Requires No Local Battery

Instantly Adjustable: Loud Soft, or Silent



Black Enamel Horn

Trouble Proof

Saves Battery Cost

Pays For Itself

Offices provided with Diaphragm Sounders enjoy uninterrupted service regardless of local conditions.

Properly attached, they require no further attention. When the relay works—the sounder works.

The Diaphragm Sounder soon pays for itself in the elimination of local battery cost, then continues to give uninterrupted service of high efficiency for many years absolutely free of cost.

More than 100 Railroads, Pipe Lines and Oil Companies have taken advantage of the money-saving possibilities of Diaphragm Sounders. Be sure Diaphragm Sounders are on the next requisition.

Write for descriptive folder

RAILWAYS LABOR SAVING DEVICE CO.
1108 Arlington Avenue, DAVENPORT, IOWA

A Money Saver to Railroads

HALL SWITCH & SIGNAL CO.

Garwood, N. J. Chicago

MANUFACTURERS OF THE

GILL SELECTOR

THE UNIVERSAL SELECTOR FOR TELEGRAPH AND TELEPHONE

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BE GUIDED

by facts, not theories
by performance records, not claims
by experience, not prophecy. Every
consideration points straight to KERITE
for permanently satisfactory and economical service.

KERITE INSULATED WIRE & CABLE COMPANY
NEW YORK CHICAGO

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THE RAILROAD

New Wire Crossing Law in Ohio

The new wire crossing law in Ohio has been passed. It amends sections 8975 and 8976 of the General Code relating to wire line construction, maintenance and operation. The law as amended becomes effective early in September. The Public Utilities Commission shall within six months after the act takes effect determine standards of maintenance and operation; also the nature, location, character of construction to be used where telegraph, telephone, electric light or other electrical wires of any kind cross or parallel the line of a railroad and to this end shall formulate from time to time other rules and regulations and detailed specifications covering each class of construction.

The American Railway Association was invited by the chief engineer of the Ohio State Utilities Commission to have representatives attend the meeting, which was held in Cleveland on June 21st, at which there were present representatives of the wire communications and railroad interests. E. C. Keenan attended for the American Railway Association, Wire Crossing Committee; Stanley Rhoads on behalf of the Inductive Interference Committee; I. C. Forshea of the Pennsylvania Railroad, Philadelphia, and M. A. Greenameyer and G. A. Dornberg, of the same railroad, Pittsburgh, and other railroad men were also in attendance. K. L. Wilkinson and B. H. Keyes represented the American Telephone and Telegraph Company and P. J. Howe represented the Western Union Telegraph Company. A committee was organized with equal representations to formulate wire and specifications for submission to the Utilities Commission for their consideration and adoption. The committee will begin its work very shortly and hope to complete its labors within a reasonable time.

A SUB-COMMITTEE of Wire Crossing, of which F. H. Shepard is chairman, held a meeting in New York on June 16th. Dr. Lloyd, of the Bureau of Standards, Washington, D. C., attended to confer on the specifications which Committee B is drafting.

W. A. FAIRBANKS, secretary of the Telegraph and Telephone Section of the American Railway Association, New York, is receiving many letters complimenting him for furnishing to the membership at large an unusually excellent printed copy of the Proceedings of the Session of the American Railway Association, Telegraph and Telephone Section, held at the Fort Garry Hotel, Winnipeg, Man., Canada, September 22, 23 and 24, 1920. It is no doubt the substantial dark blue binding that recommends the book to everyone. The appearance of the work indicates that it has been constructed for hard usage, and not for ornamenting a library shelf. The contents of the book from the first to the last page are educational in character, and its preparation reflects creditably on those who have shared in its production. The index of the book covers four pages and it is in reality a brief abstract of everything that occurred at the Winnipeg Convention.

In our issue of May 16th we had something to say about the book, but a further examination of the work convinces one that the secretary of the Association has exercised unusual care in supplying the membership with what will be probably the leading book of its kind.

The index is in alphabetical order, according to subjects, which makes it possible to locate any question with a minimum of time and trouble. For instance, we find an entry in the index, "Dictating, Transcribing and Filing Telegrams, page 340." This tells a story in itself as to the matter to be found on the page mentioned. This is true of the entire book and we believe that its readers will find the enlarged index a valuable addition to this excellent work.

C. S. RHOADS, superintendent of telegraph of the Big Four Railroad, Indianapolis, Ind., has returned from Florida, where he spent a few days.

Death of E. E. Hudson

The telegraph, the telephone and the railroad telegraph fraternity will regret to learn that E. E. Hudson, president of the Waterbury Battery Company, died of typhoid fever on June 27th, after a brief illness. In a recent issue we recorded the advancement of Mr. Hudson to the presidency of the company to succeed the late Charles B. Schoenmehl. Mr. Hudson had been identified with electrical pursuits for many years, and was at one time vice-president of the Edison Storage Battery Company. He was well and favorably known to the entire fraternity throughout the country, and his passing away at the early age of forty-two years will be mourned by a large circle of friends.

Long Distance Telephony

Experiments will shortly be made on the longest distance telephone which has yet been installed in France. The authorities are anxious that it should be possible to telephone from Paris to the Moroccan seaport of Casablanca, a distance of about 3,750 miles. M. Laffont, Minister of Posts and Telegraphs, is to conduct the experiments in person, and has left for Casablanca with a number of officials to carry out the trials. If the experiment is a success, similar apparatus will be used for other long-distance telephone lines to link up Paris with various important centers in Europe.

THE Morkrum Company, Chicago, Ill., has established a New York office at 707 World Building, where there will be at all times a force to handle the sales and maintenance of all types of apparatus manufactured by the Morkrum Company. J. B. Appleton, assistant manager of the sales engineering department, will be in charge of the New York office.

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At What Age Are You Most Fit?

Your most productive time of life, according to B. C. Forbes in the June *Physical Culture,* is not the traditional period from forty to fifty years, but the period either from fifty to sixty or from fifty-five to sixty-five, with an inclination to lean toward the latter.

This is based on the fact that the great majority of positions of leadership in business, in finance, in transportation, to say nothing of politics and education, are held by men over fifty, a great many by men over sixty, and not a few of the most important positions of all by men over seventy.

Mr. Forbes states that he analyzed the careers of the fifty men voted the foremost leaders in American business and finance and their average age was sixty-one.

The ages of the Presidents of the United States typify the age of the greatest capacity and efficiency. Not one of our first seven Presidents was younger than fifty-seven upon taking office. President Harding is fifty-six.

The biggest business job of all in America, the chairmanship of the two billion dollar United States Steel Corporation, is held by a man who is seventy-three, E. H. Gary.

The most powerful banker in America is one whose name rarely appears in print and whose personality is almost totally unknown to the public. This banker is George F. Baker, head of the First National Bank of New York, the bosom crony of the late J. P. Morgan, and a factor of tremendous importance alike in the financial, railroad and industrial world. Mr. Baker is in his eighty-second year with a brain clear as ever.

The president of the largest railroad in the world, Samuel Rea, of the Pennsylvania System, is sixty-six, and he was fifty-eight when he was elected.

There is not one important railroad in America presided over by a man as young as forty, and hardly any by men of fifty. Judge Lovett, head of the Harriman Lines, is sixty-one; President Alfred H. Smith, of the New York Central, is fifty-eight; President Willard of the Baltimore and Ohio, is sixty; President Truesdale, of the Lackawanna, is seventy; Howard Elliott, of the Northern Pacific, is sixty-one, and so it goes all along the railroad list.

Theodore N. Vail, genius of the American Telephone and Telegraph Company, had retired for ten years, came back at sixty-five and after that accomplished wonders that he could scarcely have been capable of in early life.

Alexander J. Cassatt came back out of retirement to direct the affairs of the Pennsylvania Railroad, and thereafter built the stupendous New York City Pennsylvania Terminal, and the Under-the-Hudson tunnels. Others may be mentioned.

A. Barton Hepburn, head of the Chase National Bank of New York, is at his best and is seventy-eight years old.

Wm. Dean Howells, long known as the dean of American letters, produced some of his most charming work after he had passed eighty.

Charles W. Eliot is now eighty, and as active as a young man, while doing better work.

Thomas A. Edison, at the age of seventy-four, is as active as ever. It was only quite recently that he gave Mr. Forbes the first news, since discussed throughout the world, that he is working on an apparatus designed to make as easy as humanly possible for those who have left this world to communicate with those of us who remain.

E. H. Harriman was an obscure stock broker at fifty. After that he became America's most dynamic railroad man. Herbert Spencer wrote his "Synthetic Philosophy" at the age of seventy-six.

Supreme military genius is found in men of advanced years. The German war leaders particularly, illustrated this point. Likewise in France there are three outstanding figures: Clemenceau was past the allotted span of life. Foch was on the border line of seventy, and General Joffre, who first stopped the Germans at the Marne, was well into the grandfather age. Kitchener was nearing that milestone. Our own General Pershing is sixty-one.

To sum up, there are places which younger men can fill better than older men, and there are places which older men can fill better than younger men. There are opportunities at every stage of life. Age alone, however, will not qualify a man for responsibilities. The all-essential thing is to master the basic principles of business in general and of one's own business in particular.

Success is not the exclusive perquisite of any period of life. Success, rather, is a matter of fitness —the co-ordination of ability, character and persistent determination, coupled with a wholesome respect for the rights of others.

To sum up again: The most productive period of your life depends: First and foremost, how you have taken care of your health. Second, on the nature of your occupation. Third, on the foundation you have laid for the building of success; that is, whether during the formative years of your life you have industriously gathered, digested and mastered knowledge of your business so that the years have brought you, not merely age and experience, but a constantly increasing grasp of all phases of your vocation and, as a consequence, ripened judgment and superior foresight.

Brain workers usually, a study of the subject reveals, continue to develop in ability, capacity, judgment and foresight until a ripened old age.

Therefore, my brother, if you are beginning to number more gray hairs than successes, be not discouraged. Apply yourself with redoubled earnestness to training both body and mind. Keep telling yourself what others older than you have accomplished. Cultivate confidence, courage, and self-reliance; tackle the day's work with vim and faith; saturate your whole being with hope and optimism, and by thus *deserving* to succeed, the chances are you *will* succeed. Luck has a habit of favoring the game fighter.

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J. C. Ward Taught Edison Telegraphy

One of the oldest telegraphers in the United States, if not the oldest, at least from the number of years spent at the key—59 years—has been located in the person of John Clarence Ward of Visalia, who at the age of seventy-six years is active manager and operator of the Postal Telegraph-Cable Company in that city, having been stationed there for the past fifty-three years.

And in the history of Ward's career before he came to Visalia there is romance to excite the imagination of the most adventurous youth of the present day. Ward numbers among his old friends Thomas A. Edison, known as the electrical wizard, with whom he still corresponds; General U. S. Grant of Civil War fame, John W. Mackay, founder of the Postal Telegraph-Cable Company, and General Horace W. Carpentier, superintendent of the telegraph lines in California in the early days, and knew James M. Flood and William S. O'Brien of San Francisco before they became millionaires in the Virginia City, Nev., silver mines.

Ward was born in 1844, nearly Holly Springs, Alabama, and first entered the telegraph field as an operator in 1862 in the Mount Clemens, Mich., office of the Grand Trunk Railroads, whose tracks ran from Sarnia, Ont., to Detroit, Mich. It was at Mount Clemens that Ward first met Edison, when the latter at the age of 16 was a "newsboy" on the Grand Trunk line. When Edison would arrive in Mount Clemens from a trip he would make for the telegraph office to see Ward, where the latter taught him to be an operator, which calling Edison followed for several years.

During the latter part of 1862 Ward secured a position as telegraph operator with the Union army and was attached to General Grant's headquarters, Edison going to an interior town, Cincinnati or Louisville. Ward saw service as an operator with General Grant all along the front, but during the battle of Corinth (Mississippi) in 1863, a cannon ball struck the building in which he was located, severely injuring his hand and rendering him useless for further work. Securing his release from the army, Ward returned to Chicago, and in 1865, armed with a personal letter of recommendation from General Grant, he made application to General Carpentier, then head of the telegraph system on the Pacific Coast, for a position as telegrapher and was accepted. He reached San Francisco by stage coach thirty days after leaving Chicago, with many notable incidents encountered on the way. He was sent to Sacramento to work for the Western Union Telegraph Company, but upon the failure of the Atlantic cable to Europe and the decision of the company to construct a line via Bering Straits through Alaska to Russia, Ward's services were enlisted in this enterprise and the year of 1866 found him stringing wires at the mouth of the Amur River in Siberia, near the village of Nikolaievsk, about 800 miles north of Vladivostok. About this time, however, the Atlantic cable was restored, and the company decided to abandon the Pacific enterprise, so Ward again found himself in Sacramento as an operator, later going to Virginia City, Nev., during the excitement in the silver mines. It was while in Virginia City that he met John W. Mackay, who then was a miner, together with Flood and O'Brien.

Later Mr. Ward was married to a Virginia City girl and in 1869 he was sent to Visalia by the Western Union to install a set of repeaters and take charge of the office there for a period of six months. He has been there, however, a period of fifty-three years, and in that time had become connected with the Postal Company.

Visalia, which is one of the oldest towns in the valley, had a population of 1,200 when Ward landed there by stage coach. In recounting his trip from San Francisco, Ward said he came by way of Gilroy, through the Pachecho pass to Modesto and down the valley, passing through what is now Fresno, but which was not on the map at that time.

About twenty years ago Ward was elected mayor of Visalia on a Republican ticket, although the town was Democratic in politics and all members of the city council were of the Bourbon faith. Remarking on the peculiar coincidence of his being a Republican and being born in Alabama, Ward said he came possessor of that political faith by inheritance, his father being a New Yorker.

In 1874, J. B. Johnson, supervisor of the third district in Fresno County, was a clerk in the notion and art store conducted by Ward in Visalia, in which the telegraph office was located, Johnson learning to be an operator through Ward's teaching. Johnson later went to Tulare in 1878 as an operator for the Southern Pacific, coming to Fresno in 1887, where he took the first Associated Press report ever sent into Fresno for the local papers, the *Republican* and *Expositor*. This report was copied in the Western Union office. Later Johnson was made manager of the Postal Telegraph Company in Fresno.

Ward still conducts an art store in Visalia and says the telegraph business is just a side line now, but that he has grown so accustomed to the ticking of the instrument he would be lost without it. On the wall over his instrument tables he has hanging an autographed photograph of Edison, recently received, and another of Professor S. F. B. Morse, the inventor of the telegraph.

Ward has one son, Bert Ward, who is also an operator, and two daughters, one of whom, Mrs. Dr. N. E. MacArthur, a graduate of the University of California in 1912, died in Siberia in 1914 at the same place where Ward was stringing cable wires in 1866. Dr. MacArthur was stationed there at that time as a physician of a mining company. Another daughter, Mrs. G. W. Pendergrass, is in business in Shanghai, China.

Ward, who is seventy-six, is just two years older than Edison, who celebrated his seventy-fourth birthday some few weeks ago.

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PERSONAL

THOMAS S. BRICKHOUSE, manager of the Wire Department of E. F. Hutton and Company, New York, is making a trip of inspection to New Orleans and Chicago, on company business, and will not return until the latter part of July. J. L. Phillips, of the New York office, will act as manager during the absence of Mr. Brickhouse.

AT Seward, Alaska, on June 5th, E. R. McFarland, Major Signal Corps, American Expeditionary Forces, now superintendent Telegraph & Telephone, United States Government Railroad, was married to Louise MacL. Vachon, of Tolovana, Alaska. They will be at home to their friends at Anchorage, Alaska, after July 5th.

POSTAL TELEGRAPH-CABLE COMPANY

CLARENCE H. MACKAY, president of the company, in spite of its being summer, is found at his desk every day in the week working hard on the problems that are confronting every business man today. While his duties are arduous, he nevertheless manages to dispose of all of the perplexing questions that come before the highest executive of a company.

MISS HELEN DOUGLAS REYNOLDS, of New Rochelle, daughter of Edward Reynolds, first vice-president and general manager of the Postal Telegraph-Cable Company, was married on June 21st to Allen Johnston Steen, also of New Rochelle. Both the bride and the bridegroom served in France during the war, Miss Reynolds with the Red Cross and Mr. Steen as first lieutenant of the 105th Machine Gun Company, 27th Division.

E. P. TULLY, assistant to the general manager, has recently returned after an inspection trip through the Middle West.

W. B. DUNN, secretary, has returned from a trip to New England.

NEW lines have been constructed between Oklahoma City and Tulsa, materially adding to the facilities of the company.

Managers Appointed

MARGARET GASPAR, Michigan City, Ind.; F. E. Howe, Owosso, Mich.; S. D. Purcell, Champaign, Ill.; W. M. Hill, Galva, Ill.; Edith M. Warne, Lafayette, Ind.; A. W. Schwarz, Kendallville, Ind.; G. A. Phillips, Blackville, S. C.; J. B. Duncan, Gastonia, N. C.; Mrs. L. A. Obenchain, Aiken, S. C.; W. M. Booth, Princeton, N. J.; Wilma Walker, Rawlins, Wyo.; M. Hart, Hudson, N. Y.; Marie Starin, Oneida, N. Y.; Mrs. A. M. Gourlay, Fitchburg, Mass.; G. P. LeClaire, Springfield, Mass., and F. Secoy, Troy, N. Y.

MANAGER C. B. YOUNG, Wilmington, Del., is absent on account of sickness. The office is temporarily in charge of J. T. Johnson, the day operator.

New York Operating Department

EDWARD A. CONEY has been appointed manager of the New York main operating department, vice Daniel F. Mallen, promoted to traffic inspector, in the traffic manager's office.

THE sympathy of the force is extended to Wm. M. Wolff in the death of his wife.

W. H. HARRISON, manager of the Quarantine Marine Tower for the past thirty years, is on an extended leave of absence on account of poor health. George Bennett is acting manager at Quarantine during Mr. Harrison's absence.

W. H. MURRAY, manager of the Sandy Hook Marine Tower, was a recent visitor to the city manager's office, accompanied by Mrs. Murray.

JOHN SHUGRUE, chief operator at the Produce Exchange branch, was married on June 7th to Mrs. Laura V. Holmes, for many years an operator at the Pennsylvania Station.

CASHIER JOHN A. MANNING is again back at his desk after a long siege of illness.

ON account of the heavy file of business, it has been necessary to assign another operator to our 163 Franklin Street office, in order to properly handle the largely increased traffic there.

WILLIAM ANDERSON is acting manager at the 520 Hudson Street office.

THE marine station at Fire Island, N. Y., has been closed and Manager J. H. D. Woodward has been added to the staff of canvassers in New York City.

RETURNED from vacations: John O'Brien, assistant chief clerk; W. J. Kavanaugh, south west chief, and John Logan, manager of the Marine Department.

H. J. COONEY is now at Suffern, N. Y., relieving Manager L. Cooper.

MANAGER A. C. ACKERMAN of Jersey City, N. J., is all set to handle business for the big fight.

Boston

P. J. MACKEN, for the past eleven years manager of the Springfield, Mass., office, has been promoted to the managership of the Boston main office and its seventeen branches, to succeed the late J. D. McDonald. Mr. Macken before going to Springfield was manager of the Pittsfield office, and has been in the company's service eighteen years. He is regarded as one of the most competent men in the New England States. Mr. Macken was born at Hinsdale, Mass., and has spent his entire telegraph career within the borders of that State.

O. A. CARLSON, who recently returned from Denver after spending several months there with his wife and family, is now employed in the Operating Room.

Worcester, Mass.

WM. RYAN, district foreman, Boston, paid us an official and friendly call last week.

COLIN CHISHOLM has succeeded Alton Brackett as station lineman.

Providence, R. I.

WILLARD N. MUNRO, of Kidder, Peabody Company, former manager of the Postal at this point, has recovered fully from a broken ankle, which

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was caused by being run down by an automobile.

JOHN A. MILEY, of Hartford, Conn., is a recent addition to the Providence operating force, succeeding Chester I. Oldham, who is now with a brokerage house.

San Francisco

L. J. MILLER, manager, is assisted by J. M. Smith, chief clerk; W. T. Busch, district manager; H. W. Granger and F. E. Patrick, solicitors; Mrs. D. H. Floyd, cashier; Mrs. A. Bullen, chief bookkeeper; Mrs. Carmen Moreen (formerly Carmen Fisher of Minneapolis office), ledger clerk; G. Horan, head delivery clerk, all of them hard workers.

IN the operating department: D. H. Townsend is chief operator; A. Byrne, timekeeper; D. Marcum, stenographer; H. H. Ling, night chief operator; R. D. Thomson, late night chief, Mr. Ling being recently promoted from the late night chiefship and Thomson from the First Pacific Circuit. Ralph Carr, formerly of New York Main Operating Department, was appointed day traffic chief May 1st.

F. ARNBERGER, day wire chief, C. O. Willette, day quad chief, and G. W. Parsons, night quad chief, have all returned from their vacations.

MRS. S. E. MCGILL is making splendid progress with the Telegraph School, which was recently reorganized.

DIVISION Engineer B. W. Fields and Chief Operator D. H. Townsend were recently in Sacramento making induction tests.

SUPERINTENDENT of Construction J. J. Lynch has returned from an extended trip East, having visited New York, Washington, Chicago and Kansas City.

CHIEF Operator C. F. Bunnell of Salt Lake City, Utah, is in Pocatello, Idaho, in connection with installation of telephone service to that point.

DIVISION Engineer B. W. Fields recently returned from a trip through the Northwest, installing common battery telephone boards at Seattle, Portland and other points.

FOLLOWING operators have returned from vacations: M. J. Wolinsky, E. J. Koney, M. O'Neill, Edith Arding, E. R. Zimmerman, also Service Clerks S. B. Hunter and Pauline Schmediecke.

M. ROSENQUIST has been appointed night traffic chief June 1st, vice F. Schmediecke, and E. K. Thomson, night monitor, vice Rosenquist.

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Telegraph and Telephone Life Insurance Ass'n

Assessment Nos. 701 and 702 have been levied by the Telegraph and Telephone Life Insurance Association, New York, to meet the claims arising from the deaths of: Thomas Williams, Freeport, L. I.; John F. Riley, Lancaster, Ohio; Patrick Curry, Savannah, Ga.; William H. Bush, Westfield, N. J.; M. Walrath, Rensselaer, N. Y.; Fred C. Mead, Jackson, Mich.; George D. Drisko, West Haven, Conn., and Thomas L. D. Smith, Lexington, Ky.

WESTERN UNION TELEGRAPH CO.

The Western Union's Insurance and Benefit Fund

The Western Union Telegraph Company's annual report to employees, shows that its expense for pensions, life insurance and health and accident insurance amounted during 1920 to $920,028, an increase of $140,000 over the previous year's disbursements.

Sickness insurance is the heaviest single item, with an expenditure of $414,749 for 3,757 cases of illness. The next in size is the cost of pensions, 588 employees being carried on the Western Union's pension roll; then $109,000 for life insurance payments, averaging $1,000 in each case, and $116,000 for salaries and medical expenses of injured employees. Only $11,000 was paid for State compensation insurance premiums, as the company's own plan is said to give the employees more liberal benefits than the State compensation laws.

The Western Union makes these expenditures from a fund of $1,000,000 which it restores each year to the full amount. Steady increases in the number of employees have resulted in using almost the entire million dollar fund each year.

The full expense is carried by the company without deductions or collections from its employees, but the fund is administered co-operatively by a joint committee of officials and employees.

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Eastern Division

T. W. CARROLL, general manager, New York, has returned to his office from an extended trip of general inspection through the Maritime Provinces.

C. R. TILGHMAN, general supervisor of ticker service, has just returned from an extended trip through the Lake, Central and Southern Divisions. He was in Memphis, Tenn., on June 18th, when the cutover to the new office was made. The fast self-winding tickers were installed in the Memphis cotton service in place of the old Universal type ticker. Mr. Tilghman visited Cincinnati, Chicago, Minneapolis, Omaha, Kansas City, Louisville, Ky., and Memphis. It is difficult for Mr. Tilghman to convince his many friends in the field that he has completed fifty years of service for the Western Union Telegraph Company.

THIS company will shortly move into new and attractive offices at both Schenectady and Watertown, N. Y.

R. C. FOLGER, office manager of General Manager T. W. Carroll's staff, was married in New York on June 22nd to Mrs. Margaret P. Stewart of Asheville, N. C. Mr. Folger and his bride were showered with congratulations by their many friends. The honeymoon will be spent in Canada and the Northwest.

MISS B. SHARP, formerly of Superintendent F. R. Veale's office, has been transferred as chief bookkeeper, New Haven, Conn.

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C. L. FITCHBORNE has been appointed acting manager at New London, Conn. Mr. Wilkins, temporarily in charge, has returned to his old duties in Superintendent F. R. Veale's office, New York.

WILLIAM KLEINSCHMIDT, formerly manager at Vineland, N. J., has been transferred to the managership at Newark, Del.

D. F. BROWN, wire chief of the Washington, D. C., office, was a recent New York and Boston visitor. During his several days' stay in New York he made it the occasion to call on his numerous friends. Mr. Brown in the seventies and eighties was a member of the New York staff. He has been a resident of Washington, D. C., for the past thirty years.

G. E. WOOD has been appointed chief operator at Atlanta, Ga., vice C. E. Harrison, transferred to Jacksonville, Fla., as chief operator, to take the place of S. C. Ramage, transferred to division headquarters.

P. H. STRAWN has been appointed chief operator at Chattanooga, Tenn., vice William H. Halliburton, transferred to Nashville, Tenn., as night chief operator.

E. M. SOMMERS has been appointed chief operator at Elko, Nevada, vice E. M. Chambers, resigned.

S. P. BOUGHTON has been appointed chief operator at Norfolk, Va., vice E. M. Kilpatrick, appointed Morse supervisor.

THE Columbia, S. C., office of this company has been remodeled and brought up to date at a cost of $40,000 and that city now enjoys exceptional telegraph facilities to all parts of the United States.

WILLIAM J. FRANCIS, aged fifty-seven years, formerly manager of the Western Union Telegraph Company at Atlanta, Ga., died in that city on June 2nd.

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Lake Division

WESTERN UNION POST of the American Legion participated in the Memorial Day parade and was well represented by employees of the company, who constitute ninety-five per cent. of the membership. Considerable applause greeted the Western Union men at various points along the line of march.

BRANCH offices "TP" and "OR" were opened last month. The former, in the twenty-two-story Transportation Building, serves the building in which it is located and considerable of the surrounding territory heretofore divided between "MB" office in the Manhattan Building, "WH" in the Dearborn Street station and "BO" office in the Grand Central Depot. A. Nygood has been appointed manager. "OR" office is located in the North Shore Electric Railway Depot. It is in charge of Manager L. Davidson.

DISTRICT Commercial Manager J. E. Meaney, who is on the road to recovery after a severe siege of sickness, will depart for California next week and will probably remain there for a considerable period.

THE sympathy of his many friends in the service will go out to Bruce R. Allen, formerly of Cincinnati, now on the staff of General Manager A. C. Cronkhite, at Chicago, in the death of his wife, who died in the Chicago Presbyterian Hospital, on June 3rd.

SIX months ago, to test out the practicability of the theory that it would be economical to establish a school, with a competent instructor, to train managers, the Lake Division established a school at Niles, Michigan, under the supervision of R. H. Underwood.

In these six months the school has conclusively demonstrated the advantages of properly training managers before assigning them to duty, and that the system of instruction at Niles is thoroughly practical and inexpensive from the standpoint of results. Now, when a manager is required in an emergency, the superintendent merely draws one from the school, and the division as a whole is reflecting the good that comes from having always available a dependable source of supply in time of need.

There have been three classes of students in the school: juniors, with no Western Union experience, who require complete and thorough training; seniors, who may have had telegraph experience with railroads or in branches of the Western Union other than the commercial, and seniors who have actual managerial experience, but have become rusty on current routines and new methods of business. These latter, of course, require only review and a general brushing up.

The maximum period of instruction has been six weeks; minimum two, the managers sent in for review requiring only the minimum time.

The course of instruction embraces all of the duties of the small office manager, particular attention being given to bulletin study, so that managers may be led to rely on the printed instructions to be found in all offices. Each student is required to make up three complete sets of monthly reports, and taught, day in and day out, the importance of good housekeeping.

Forty-four managers have been graduated from the school, and there are now ten enrolled.

MANAGER ARMSTRONG of Peoria, Ill., has had printed circulars prepared from an engraving of his bicycle messenger boys, and the latter take pride in distributing the circulars among the company's customers and never fail to point out their pictures in the group. This is a sample of effective advertising.

ADAM W. BEIDLER, of Chicago, well known to the old-time telegraphers throughout the United States, died at the home of his daughter at Atlanta, Ga., on June 6th. Mr. Beidler was one of the best operators in the Chicago office between the years

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1875 and 1881, when he became identified with a brokerage concern. Later on he was elected president of the Illinois Terra Cotta and McRoy Clay Works, with which interests he had been identified until about six years ago, when he retired from active business. He was born at Reading, Pa., in 1857. The funeral services were held at Atlanta, but interment was at Chicago. Mr. Beidler lived with his wife at the Hotel Metropole and was a member of the Union League and Midlothian clubs.

F. W. DAEBEL, of Valparaiso, Ind., who since the war began was in the Government service, is again occupying a position at the key in Valparaiso.

C. E. JONES, formerly and for many years located at Dayton, Ohio, is now in California, where he expects to remain permanently.

Philadelphia

DANIEL GOOD, of the traffic force, has just recovered from a severe cold, confining him to his summer home, Ventnor, N. J., for about three weeks. Mr. Good has returned to his duties at the office much improved.

FRANK E. MAIZE, former president of the Electrical Aid Society of Philadelphia, and prominent in the affairs of the Dot and Dash Club, has been advanced from assistant manager to manager of the Electrical Bureau of the City of Philadelphia. Mr. Maize, with his wife, is now enjoying a three weeks' vacation at Atlantic City.

DAVID HOMER BATES of New York was a recent Philadelphia visitor. Mr. Bates is well known to many Philadelphians on account of his previous official connection with the Western Union Telegraph Company and the Baltimore and Ohio Telegraph Company.

All America Cables

JORDAN HERBERT STABLER, vice-president, New York, sailed recently on the steamer *Cedric* for Europe.

THOMAS MORRIS, of the Barranco staff, has been retired on pension.

A. V. BEAVEN, late station electrician, Buenos Aires, arrived in New York from England on the steamer *Aquitania,* enroute to Puerto, Mexico, where he has been appointed station manager.

W. HANNAH, manager of the New York office, who has been ill since the end of February last, is greatly improved, and has gone to Rockport, Maine, to recuperate.

W. J. PARK, traffic controller, Buenos Aires, has been transferred to Valparaiso. J. Clark has been appointed traffic controller at Buenos Aires.

FRANK PHELAN, general commercial superintendent, sailed for New York from Rio de Janeiro on the steamer *Callao* on June 20th, returning from an extended trip to South America.

CANADIAN

JOHN MCMILLAN, manager, Canadian Pacific Railway Company's Telegraphs, Montreal, has just returned from a trip of inspection to the Pacific Coast. Mr. McMillan says: "He found the service at the various cities very satisfactory, and that in the country between the Red River and the Rocky Mountains the crops look exceptionally good, and in fact, he has never seen the country look better at this time of the year."

H. R. 5215—United States Military Telegraph Pension Bill

By DAVID HOMER BATES, New York

For over forty years our Society has knocked at the doors of Congress in an appeal for a soldier's pension and homestead rights.

On January 13, 1920, a final hearing was granted me in support of the measure which the Military Affairs Committee reported to the House with favorable recommendation, but the 66th Congress adjourned March 4th without passing the bill.

Representative McKenzie of Illinois reintroduced the measure in the 67th Congress and after consideration, the Military Affairs Committee on May 12th last again reported it favorably. We have every reason to expect that it will pass the House before long, and then we must await action by the Senate.

Meantime, our comrades, whose average age is over eighty-one years, are in the order of nature dying off rapidly, twenty having passed away since my last hearing before the Military Affairs Committee.

Our bill provides a soldier's pension of $50 per month to all of our members who served ninety days, and to their widows $30 per month.

Telephone Society of Boston, Mass.

The Telephone Society of Boston, Mass., listened to an address by H. S. Osborne, transmission engineer, Department of Operation and Engineering, American Telephone and Telegraph Company, New York, on the "New Key West-Havana Telephone Cables," on the evening of June 27th. Mr. Osborne illustrated his remarks with moving pictures and slides of numerous features of the work, and gave first-hand information, as he was on the job himself.

This was the annual meeting for the election of officers for the season 1921-1922 and the last meeting before the summer recess. Gordson S. Wallace is secretary of the Society.

Obituary

J. F. REILLY, aged sixty-nine years, died at the home of his daughter at Lancaster, Ohio, on April 8th. He had been a resident of Washington, D. C., for the past thirty years. Previous to that time he was well known in Eastern and Southern States, having worked in almost every large office.

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Radio Corporation of America

PRESIDENT E. J. Nally has arrived in London.

GENERAL MANAGER W. A. Winterbottom has completed his visit in Norway and returned to England.

GENERAL SUPERINTENDENT E. B. Pillsbury has returned from a week end visit to Boston.

GEORGE W. HAYES of the Sales Division, has returned from a western trip, which took him to Kansas City and Minneapolis.

W. A. GRAHAM, operating engineer, was a recent visitor to the Marion, Mass., station.

THE Carpentier-Dempsey contest will be reported from the ringside on July 2nd by wireless telephone by the National Association of Wireless Amateurs. Bulletins will be broadcasted for the information of amateurs.

THE first meeting of the recently organized Static Club was held at the Woolworth Building on June 22nd for the purpose of completing the organization. David Sarnoff was elected vice-president. The other officers are Dr. A. N. Goldsmith, president; G. S. DeSousa, treasurer, and E. B. Pillsbury, secretary. Four meetings will be held each year. They will be in the nature of smokers devoted to good fellowship and discussion of topics of general interest. One meeting each year will be open to the ladies.

Marconi Wireless Telegraph Company of Canada, Ltd.

A. H. MORSE, managing director, sailed for England on June 4th, and will be absent for about six weeks.

G. M. WRIGHT, of the English Marconi Company's engineering staff, who has been carrying out experiments in reception in the vicinity of Montreal, sailed for England on the steamer *Megantic* on June 18th. His colleague, L. D. Hill, is continuing the experiments at the Louisburg Transatlantic Station.

THE weekly concerts radiated by wireless telephone from the company's works, 173 William Street, Montreal, continue to enjoy much popularity and are appreciated by a rapidly increasing number of amateurs.

F. A. BARROW of the engineering staff recently returned from an inspection trip through the Great Lakes division.

D. R. P. Coats has been appointed publicity manager.

International Radio Telegraph Company

THE International Radio Telegraph Company is co-operating with the Westinghouse Company, the Navy Department and the Radio Corporation of America, in broadcasting by radio telephone the results of the Dempsey-Carpentier fight on July 2nd.

H. P. DAVIS, vice-president, whose headquarters are fixed at Pittsburgh by his duties in the supervision of the engineering and manufacturing work of the Westinghouse Electric & Manufacturing Company, recently spent several days in New York, largely on business of the International Company.

THE four continuous-watch coastal stations of the International Company are said to be receiving from seventy to ninety per cent. of all the messages transmitted from ships at sea to commercial stations in the North Atlantic zone. "Via New London" has become a watchword among ship operators, largely because of the location and efficient management of that station.

CALVERT TOWNLEY, vice-president, has returned to New York after an enjoyable trip to New Haven for the thirty-fifth reunion of his class in the Sheffield Scientific School, Yale University.

ON a recent voyage of the steamer *Aquitania*, a passenger filed two urgent messages. The *Aquitania's* operator called the International station at Cape May; the Cape May operator delivered the messages direct by telephone and secured replies, which were re-transmitted to the ship and acknowledged. The entire operation consumed less than five minutes.

JOHN V. L. HOGAN, manager of the company, New York, has completed an inspection trip to several of the International coastal stations.

WORKING with the "break" system, the Brooklyn station recently took fifty messages from the steamer *Dante Alighieri* in less than forty minutes. The ease and speed of operation was as great as that characterizing line wire working.

COLONEL L. R. KRUM, former superintendent of marine installation of the International Company, has joined the Radio sales staff of the Westinghouse Electric & Manufacturing Company.

L. R. ROBINSON, formerly traffic solicitor of the International Company, has severed his connection with the organization.

Government Radio Operators Wanted

The United States Civil Service Commission announces an open competitive examination for radio operator. A vacancy in the Lighthouse Service, Ketchikan, Alaska, for duty on Tender "Cedar," at $1,380 a year, and vacancies in positions requiring similar qualifications throughout the United States, at this or higher or lower salaries, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatements, transfer, or promotion.

To Urge Increased Communication With Australia

Premiers Hughes of Australia and Massey of New Zealand are both interested in questions of communication, and they intend to impress upon the Imperial British Conference, to which they are delegates, now taking place in London, the practicability of establishing a chain of wireless telephone and telegraph stations around the empire, and also a network of government owned cables in addition to those now operating between Great Britain and Canada and between Canada and Australasia.

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Telegraph and Telephone Age

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CONTENTS

Mechanics of the Two Coil Line Switch. By Harry E. Hershey. (Continued from page 296, July 1st Issue) 314

Courtesy. The French to Control Wire and Radio Systems in Ecuador. 315

Annual Report of the Telegraphy and Telephony Committee, American Institute of Electrical Engineers 316

Old Time Telegraph Reminiscences. By Robert F. Easson, Toronto... 320

The Telephone and Telegraph Monopoly in Foreign Countries..... 322

Student's Course in Technical Telegraphy. By Louis Casper. Lesson 31 323

To Combine Government Wire Services. Knights of the Key. English Deficits 326

The Railroad.—Committee of Arrangements. Telegraph and Telephone Section of the American Railway Association, Cleveland Session... 329

Death of G. H. Groce. Obituary. The Back Stage Side of the Wire Business 330

Reporting the Big Scrap by Wireless Telephone..... 331

Personal. Postal Telegraph-Cable Company. Radio Control Over Ships a Success 332

Western Union Telegraph Company 333

Radio Corporation of America. International Radio Telegraph Company. All America Cables 334

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Mechanics of the Two Coil Line Switch

By Harry E. Hershey,
Of the Automatic Electric Company, Chicago

(*Continued from page 296, July 1 Issue*)

The two coil line switch is the form of Keith switch most commonly met with. As shown in Fig. 18, it consists primarily of a double wound relay. This relay carries two armatures as shown, the smaller or bridge cut off armature operates to shift a spring assembly. The larger or plunger arm carries upon its extremity the line switch plunger, which, when forced in the line switch bank causes the movable springs to make contact with the stationary springs. An interesting feature of the line switch is the relative pulling power of the two windings. If the pull down winding be energized it will cause the operation of the B. C. O. armature, and will also cause the plunger arm to force the plunger into the line switch bank. Should the B. C. O. winding be energized it will cause the operation of the B. C. O. armature, but will not be strong enough to operate the plunger arm. If, however, the two armatures are already in an operated position the B. C. O. winding will have strength to maintain both armatures even though the P. D. circuit be opened. The resistance of the P. D. winding is usually 46 ohms, and that of the B. C. O winding 1,250 ohms. The line relay X is a slow acting relay of 500 ohms.

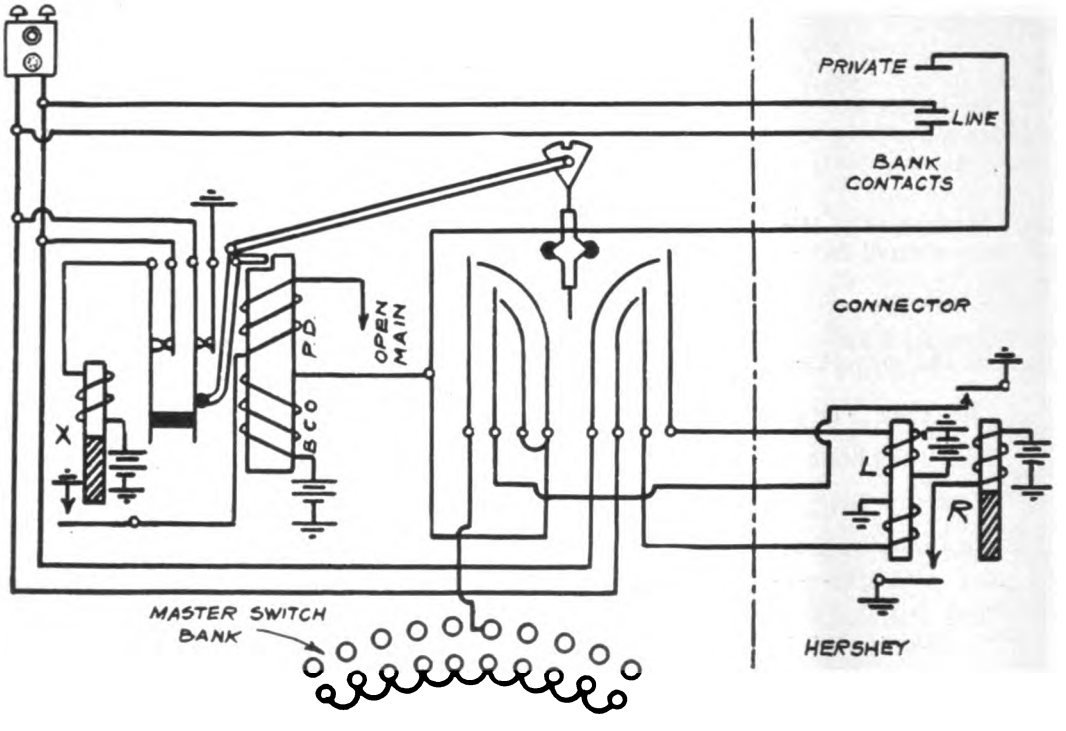

Fig. 18. Two Coil Line Switch

Circuit Reading of the Two Coil Line Switch

As shown in Fig. 18, the two conductors from the telephone enter the office and branch to three different points. One branch goes to the connector banks, through which it is multiplied in order that this telephone may receive incoming calls. The second branch of the lines goes to the B. C. O. springs, and the third to the line switch bank, where it is multiplied through ten sets of springs. When the subscriber removes his receiver a circuit may be traced from ground, B. C. O. springs, through the instrument, B. C. O. springs, line relay X, to negative battery. The line relay X energizes and closes a circuit from ground through the pull down winding to open main, which at this time can be considered as ordinary negative battery. The P. D. winding will energize and cause the B. C. O. armature and the plunger arm to operate. When the B. C. O. armature operates the line relay X will be cut off, but it will not release its armature immediately on account of its being a slow acting relay.

When the plunger enters the bank a circuit may be traced from ground, lower winding line relay L, bank contacts, through the instrument, bank contacts, upper winding relay L, to negative battery. Relay L will energize and close the circuit of release relay R. Relay R, upon energizing will close a circuit which may be traced from ground, springs of relay R, bank contacts, B. C. O. winding to negative battery. The B. C. O. winding will energize and hold both the B. C. O. armature and the plunger arm in an operated position, even after the de-energization of the P. D. winding, which will occur as soon as the line relay X releases its armature. It will be seen that the slow acting effect of

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relay X must be great enough to keep the P. D. circuit closed until such time as the release relay of the connector sends back ground on the release trunk to energize the B. C. O. winding. A branch of the above circuit extends the release trunk ground to the private bank contact, thus as soon as the line switch plunges in there will be ground placed on the corresponding private bank contact to protect the calling line from intrusion. Release trunk ground also passes through a pair of bank contacts to the master switch bank. It is this ground which causes the master switch to operate and move the remaining line switches opposite an idle trunk.

After the conversation is completed the restoration of the receiver at the calling sub-station causes relays L and R to de-energize. Relay R, upon de-energizing removes the release trunk ground, the B. C. O. winding will then de-energize and allow the line switch to return to normal. At the same time the protecting ground is removed from the corresponding private bank contact, and from the contact of the master switch bank. As a result the master switch may again stop before this particular trunk, as it is now idle.

In a previous issue the statement was made that a slow acting relay attracted its armature approximately as quickly as an ordinary relay. It is this minute lag in the pulling up of a slow acting relay that makes it possible for the two coil line switch to operate as it does. If the armature of the line relay X were on the coil end, instead of on the slug end, the line switch would fail to operate. The result of changing the position of the armature on relay X may be explained in this way; the first increment of current that passes through the winding will produce lines of force, the majority of which cut the slug, thus a current will be induced in the slug which will oppose the further up-building of the lines of force. If the armature is on the slug end it will not be attracted until such time as the core is fully saturated, as a result the slow acting relay will maintain its armature in an operated position for some time after the B. C. O. armature opens its circuit. A few of the first lines of force produced will leak out at the sides of the coil without cutting the slug. If the armature is on the coil end of relay X these lines of force will cause the armature to operate, but since the core of the relay X is not fully saturated it will have practically no slow acting effect, and will release its armature as soon as the B. C. O. armature opens its circuit.

QUESTIONS

A. If the B. C. O. winding became reversed what effect would it have on the operation of the line switch?

B. If the release trunk ground was not led to the private bank contact what complications would arise?

C. What would be the operation of the line switch if the positive, negative, or release trunk were open to the connector?

D. If a line switch indicates an open trunk, could you step to the connector, and by merely a visual inspection decide as to whether or not the trouble was due to an open release trunk?

(To be continued)

Courtesy

H. F. Thurber, president of the New York Telephone Company, has this to say on courtesy:

"Employees of this company have always been noted for their courtesy in dealing with the public and in their relations with each other. Courtesy is one of the fundamentals of our business and is one of our traditions. During the past few years our forces have been greatly increased; a large number of new people have come into the business; we have had to contend with abnormal conditions; and the pressure of work has been severe. It seems to me that it would be well worth while at this time for each one of us to review our personal dealings with the public to make sure that we are genuinely courteous. This is particularly necessary when talking over the telephone where the tone of voice plays such an important part.

Courtesy as I understand it requires that we should in all circumstances not only show a friendly interest in the wishes of our subscribers and a real desire to help them, but that we should to the best of our ability accomplish what may reasonably be expected of us.

I feel sure that all employees will join in the determination that the work of all departments of the company shall not only be technically efficient, but shall be done in a spirit of helpfulness and courtesy."

The French to Control Wire and Radio System in Ecuador

The Compagnie Generale de T. S. F. of France, has concluded a contract for a period of thirty years with the Government of Ecuador for the working of the telephones, telegraphs, and wireless service in that country. The Government of Ecuador will pay the company an annual subsidy of 430,000 sucres (about 1,200,000 fr.), which will be increased in the event of any extension of the system. The company will deduct from the gross receipts the sums necessary for the working of the lines, for the payment of interest on the capital invested in the concern, and for the sinking fund. The State will have a share in the net profits. The telephonic apparatus will be automatic and constructed on a system which has been perfected by French experts. The telegraphic and wireless apparatus will also be on French models. The engineer who is in charge of the enterprise in Ecuador, considers that it will be possible to find in the country itself almost the whole of the necessary staff, as there are a number of excellent engineers in the Republic.

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Annual Report of the Telegraphy and Telephony Committee, American Institute of Electrical Engineers

The annual report of the Telegraphy and Telephony Committee of the American Institute of Electrical Engineers has been submitted to that asso-tion by Donald McNicol, Chairman, and signed by the other members of the Committee, as follows: O. B. Blackwell, R. E. Chetwood, E. H. Colpitts, Charles E. Davies, S. M. Kintner, Stanley Rhoads, A. E. Silver, Arthur Bessey Smith and F. A. Wolff. The report was made up from contributions forwarded by the above named members.

The following report contains a review of the engineering status of the arts of telegraphy, telephony and radio communication during the Institute year 1920-1921:

Wire Communication Along Railroads

Technical developments of the past year have placed the telegraph and telephone departments of railroads in the United States and Canada in a more serviceable condition than they have heretofore been. The work of the technical committees of the Telegraph and Telephone Section of the American Railway Association has been added to by the institution of committees handling the subjects of telephone transmission, radio and wired radio communication, and technical education for employees. A considerable number of new undertakings are now about ready for service trial in the field. Improvements are embodied in recommendations submitted by committees working on the problems of protection against lightning disturbances, inductive interference, electrolysis, wire transpositions, and stronger pole line construction.

The Railroad Administration's trunk circuits radiating from Washington, D. C., were promptly discontinued at the termination of Federal control of the railroads, and the wires returned to the control and use of the individual railroads. The general interchange of wire service between the various roads, through connecting railroads not concerned in the purpose of the communication, was at the same time discontinued.

The employment of recent types of telephone repeaters has been arranged for by a number of the large railroads for the purpose of improving long distance telephone service. On the New York, New Haven and Hartford Railroad the installation was completed of an aerial cable between New York and New Haven. Circuits in this cable have telephone repeaters, and on some pairs loading coils are provided.

The subject of stronger pole lines has been given serious attention on many railroads. On some lines the factor-of-safety plan of construction has been extended.

During the year the increase in telephone lines has not been great, due mainly to retrenchment following temporary business depression.

Some progress has been made in replacing older types of calling selectors, and changing the method of operation of others in order to obtain low-resistance simplexes for telegraph service. Also, some tests have been made with wired radio in conjunction with engineers of the United States Signal Corps, under the direction of Major-General Squier, Chief Signal Officer.

The practice of welding joints in exposed lines has been extended.

Printing Telegraph Systems

The application of automatic printing telegraph systems to commercial requirements is being extended, both in the United States and Canada. A noticeable tendency is the gradual standardization of apparatus and of methods. Development generally is along the line of reducing equipment maintenance costs by simplifying the various printer units and making them more rugged mechanically.

For trunk circuits carrying heavy traffic, the Multiplex system is being widely applied. A Multiplex system provides two or more two-way channels per wire. The ease with which the Multiplex system may be made to meet traffic growth—simply by the addition of operating tables and associated equipment—is one reason for its success. Another reason is that it allows taking full advantage of the signaling capacity of a wire. With the Multiplex it is possible to handle eight hundred or more messages per hour over a single conductor; correct incidental errors instantly, and have every message so handled ready for delivery to the addressee as soon as it has passed over the wire. An objection to older automatic systems was the time required in preparing the message for delivery after its receipt. There was also delay in correcting incidental errors

A new field being entered by printing telegraphs is that including private branch offices, and way-office circuits. Developments in this direction center on the problem of producing a tape-printing machine so dependable as to require only occasional attention from mechanics, and so simple in operation as to be handled satisfactorily by an ordinary typist. A promising use for this system is its employment by commercial concerns and industrial establishments for intercommunication purposes and for communication betwen business offices and telegraph offices.

"Start-Stop" Printing Telegraph Systems

In all modern printing telegraph systems the principle of synchronism is employed. Systems employing continuous synchronism require that the apparatus at the transmitting and receiving stations be in phase at all times, and usually consist of distributors having constantly rotating arms operating in unison. Continuous synchronism is generally used when more than one simultaneous transmission over one wire is desired.

Systems not employing continuous synchronism, but providing instead that a signal be transmitted to start from a position of rest, the arms of the transmitting and receiving distributors or their equivalents, are called "Start-stop" systems. The arms of the transmitting and receiving distributors are timed to rotate at practically the same speed for

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one revolution and then come to rest—one rotation for each letter, figure or other character.

The Start-stop systems of recent American development use the five-unit signaling code. For circuits where the traffic requirements are such as to call for a speed of sixty words per minute, Start-stop systems are satisfactory and their use is being extended. Such circuits are operated duplex over distances of 300 miles without intermediate repeaters. The employment of repeaters permits operation over greater distances.

Start-stop systems may be grouped into two classes: In the first, the distributor, transmitter and printer are separate units. With systems of this class a speed of approximately sixty-five words per minute is possible. In the second class, the distributor, transmitter and printer are self-contained in a single unit, the transmitter being controlled by a typewriter form of keyboard. Systems of the second class are also known as Simplex printers and are operated at a speed of about fifty words per minute.

Submarine Telegraph Signaling

From the year 1858 until 1871 submarine cables were operated in one direction at a time only. Since the latter year cables have been operated duplex. From 1871 until 1908 important improvements were made in existing apparatus. In the latter year "magnifiers" were introduced which permit operation of long cables with considerably reduced line current strength, with consequent increase of signaling speed—fifty per cent. or more above previous speeds.

In recent years a tendency in cable signaling has been to introduce terminal apparatus aiming at reduction in operating costs. Tape perforators of the mallet type have been replaced by perforators having keyboards similar to those of a typewriter, permitting largely increased output per operator in a given time. Automatic transmitters are used which insure continuous transmission of uniform signals. Automatic relays have been installed to connect together sections of cables to permit direct working without the necessity of manual relaying of messages. In some cases, instead of direct automatic relaying, a re-perforator is introduced which is actuated by signals from one section of cable perforating a tape which feeds into a transmitter sending into an adjoining section of cable.

Considerable progress has been made in applying printing telegraph systems to submarine cables. Experimental installations have been in actual service operation during the past year or two. The application of printing telegraph systems to ocean cables reduces operating costs and, perhaps to some extent, increases operating speeds. Further improvements now being made in ocean cable printing apparatus will result in much simplified equipment with promise of an increased output in unit time.

Protection of Lines Against Lightning Disturbances

No radical changes have recently been made in the character of protection installed on communication lines for protection against lightning disturbances, but the growing need for continuous operation of lines has renewed interest in developing efficient self-restoring lightning arresters. Some of the more dependable existing types of arresters have been improved with the object of bettering the protection and lessening circuit interruption after static charges have been dissipated. Present types of arresters embody the principles of the air-gap, vacuum-gap, and choke coil.

Protection of Lines Against Lightning

Promising progress has been made during the year toward the solution of the problem of inductive interference control and reduction. The growing difficulties in keeping communication and power circuits in well separated locations—attendant upon the rapidly increasing demands for these services—has brought a real appreciation of the need for thorough and systematic attention to the co-ordination of the engineering of these facilities.

As a consequence, increasing effort is being directed toward learning sound methods of co-ordination, and toward the application of these methods in the initial planning of construction. Prominent among these efforts toward more systematic treatment of the problem are facilities inaugurated by the National Electric Light Association for centralized study by a committee and engineering staff specializing in this subject.

It is an indication of sound progress that the problem is now recognized as of mutual concern by the various electric utilities. The trend is clearly toward co-operative study and treatment as in the best interests of these utilities.

Noteworthy in this direction is a step taken by the American Telephone and Telegraph Company and the National Electric Light Association in developing broadly laid plans for co-operative procedure in working out and applying methods for the control and reduction of inductive interference with telephone service.

So far as the committee has learned, there has been no outstanding development during the year in the form of specific devices or methods applicable to either the communication or power facilities for inductive interference reduction. It is, however, of interest to note that the engineers of the American Telephone and Telegraph Company have developed and given some preliminary field use to a new type of "noise meter," designed to measure the degree of disturbance indicated in a telephone receiver without bringing in the personal factor of the observer in judging equivalent noise as is the case with the older "noise" standard employed by the telephone companies.

Automatic Telephony

During the year there was in general a continuation of refinement in the design of automatic telephone apparatus. So far as radically new develop-

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ments are concerned no epoch-marking inventions have been disclosed. Further progress has been made in standardization of apparatus and in details of maintenance and operation. The undertaking to standardize nomenclature resulted in the publication of about one hundred definitions of current terms.

There have been placed in service three devices, the introduction of which may have an important relation to the further development of the art:

1. The call indicator, used in calling from an automatic office to a manual office during the period of mixed working, which displays the call number before the operator and permits automatic subscribers to dial all numbers.
2. A calling device number plate with office names in addition to numbers, to permit retention of office names in small multi-office exchanges converted to automatic.
3. A calling device number plate with the alphabet in addition to the numerals to enable the first few letters of the office name to be used as numerals in a large multi-office exchange.

Carrier-Current Telephony and Telegraphy

At the Midwinter Convention of the Institute there was presented a paper on "Carrier-Current Telephony and Telegraphy," by two members of the committee—Messrs. Colpitts and Blackwell—which gives a history of this art; states the fundamental principles which underlie it; discusses the action of open wire lines and short lengths of cable to the frequencies used in carrier operation, and describes the carrier systems which have been developed and put into commercial use in the Bell Telephone System. The historical part of this paper is interesting, showing the principles underlying carrier-current operation as having been worked out at an early date, but that economical use of such systems was not possible until the introduction of the three-electrode vacuum tube as a modulator, demodulator and amplifier; until the art of transmission over wires, including repeater operation, had been developed to its present state, and until the development of electric filters had been carried to the point permitting effective utilization of comparatively low carrier frequencies.

The commercial telephone installations described give four added telephone circuits over each pair of line wires in addition to the usual telephone and telegraph facilities provided by the wires. Commercial telegraph systems provide as many as ten added duplex telegraph circuits, also in addition to the usual facilities.

As pointed out in the paper, the apparatus involved in such systems is necessarily complex, and, therefore, expensive, so that systems of this type are in general economical only for comparatively long circuits.

Radio Telegraphy

Radio communication during the past year has undergone a reorganization of ownership of the important patent rights which should relieve a very complicated situation and result in placing in use equipment superior to that heretofore employed. The radio companies are now in a position to proceed without imminent fear of infringement of essential patent rights.

The superior serviceability of continuous waves, with beats reception, has been recognized and the principle is being extended in practice.

The ease with which short waves can now be controlled from electron tubes has had much to do with the rapid change in the practice of the art. Spark transmitter systems, for all but ship emergency uses, are no longer planned for commercial operations.

With the more general use of continuous wave systems and the resulting greater possibilities of selectivity there is a strong legislative sentiment in favor of more liberal regulations. The use, with continuous waves, of a large number of working wave-bands, with a reserved emergency and calling band, will do much to eliminate the interference and troublesome delay which now exists at each of the several important ocean harbors. The sentiment that favors greater freedom in wave-band selection also favors the enforcement of more rigid requirements of purity of radiation and the securing of minimum damping at transmitting stations.

Transoceanic service has been further improved with a resulting increase in the volume of traffic handled and in the quality of service rendered. The gradual elimination of minor defects that commercial operation has brought to light has resulted in pronounced improvement in continuous operation over long distances.

The accomplishments in static elimination, permitting the better utilization of means of amplification of signals, have done much to overcome operating variations due to atmospheric disturbances and other causes.

A broadening of the field is noticeable in adapting radio systems and methods to new uses, and several such applications are looked for in the immediate future. The remote control of switches by means of radio is now being considered.

The superheterodyne method of reception, due to E. H. Armstrong, stands out as an important contribution of the past year.

Radio Telephony

The progress of radio telephony during the past year has been in the direction of the application of the three electrode tube, developed during the past seven years, to a point where it serves as an amplifier delivering comparatively large power, or as a reliable detector or telephone repeater, to the problem of supplying radio service of a commercial character in connection with existing wire lines.

This progress in all its phases is illustrated in a radio telephone toll circuit now in commercial operation in the territory of the Pacific Telephone and Telegraph Company, furnishing telephone service between the Island of Santa Catalina and the wire

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network of the mainland centering in California.

The Avalon-Los Angeles radio toll circuit is believed to be the first radio telephone installation in the world to be opened for public service. The service was inaugurated on July 16, 1920. The radio circuit is operated according to wire line methods. The operating circuit is from Los Angeles, Cal., to Avalon on Catalina Island. The radio section is between coastal stations thirty-two miles apart. The circuit is provided with through line ringing of a type which is free from interference, and a superposed telegraph circuit capable of forming a link in a duplex wire telegraph circuit. The transmission and quality over the circuit are of such high standards that it is regularly connected, when required, into the long distance telephone circuits. On several occasions conversations have been carried on between the steamer *Gloucester* in the Atlantic Ocean, and the Avalon office in the Pacific Ocean, the transcontinental telephone wire line being used as the connecting link overland.

The extensive application of types of electric wave filters in transmitting and receiving circuits has made it possible to obtain a good quality of spech and at the same time to secure greater selectivity than was possible with the prior art. The use of loops for receiving and of shorter wave lengths for short distances has to some extent reduced interference.

Standardization of Terminology

A sub-committee of the Standards Committee of the Institute has been engaged in the work of formulating standard definitions of terms most commonly used in telegraphy, telephony and radio signaling. The importance of such work, especially in the case of an art developing as rapidly as is the art of electric communication, is obvious. Not only is it of advantage to eliminate ambiguous and superfluous terms, and terms wrongly used or etymologically incorrect; although these may have come into extensive use, but it is especially important to select the most logical and appropriate terminology called for by the development of the allied arts so as to get a proper start and thus, in a large degree, avoid the necessity for later revision, and perhaps at a time when incorrect terms have been widely adopted in operating practice.

The terms so far chosen and defined have been simply and unequivocally, though broadly, defined in the light of a comprehensive survey of the field to which they are appropriate, thus eliminating the necessity of a multiplicity of terms covering slightly different applications.

Consideration also has been given to bringing about agreement so far as practicable betwen English speaking countries. In quite a number of instances the same term is given different meanings, or different terms are employed to convey the same meaning. The sub-committee on Telegraphy, Telephony and Radio is, therefore, co-operating with a corresponding committee of the British Engineering Standards Association, with the above mentioned object in view.

The Bell and Independent telephone interests have found it mutually advantageous to unify not only operating methods, but also operating phraseology, for the purpose of facilitating the handling of interconnecting traffic involving co-operation between two groups of operators. This supplies an excellent illustration of the value of standardization as applied to terminology which can promptly be translated into dollars and cents.

Education in Communication Engineering

Considerably greater attention is now given in American universities and technological schools to instruction and research work in communication engineering. Sheffield Scientific School, Yale University, has an organized course in this field, and Columbia University, New York, has a course in submarine cable engineering. The College of the City of New York has a thoroughly equipped and organized communication laboratory, and at a number of the United States Army Departmental headquarters, or in their vicinities, thoroughly organized and equipped schools are maintained which cover these subjects.

In addition, the programs announced for the rapid introduction of automatic or machine switching in telephony, and the continued development of machine telegraphy will necessitate the instruction of large numbers of present employees of the operating companies, as well as recruits, who will be required to install, supervise and maintain the equipment. In this connection it is recognized that it is especially desirable to speedily perfect the terminology and thus to make available a common language for teaching purposes as well as for field use.

There is a noticeable drawing together of the engineers of the arts of telegraphy, telephony and radio signaling. The communication engineer of the immediate future will have to be well versed in the engineering of the three divisions of the general subject.

There are approximately six hundred communication engineers identified with the Institute, and the number is now increasing at the rate of about forty applications per month.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by Telegraph and Telephone Age, 253 Broadway, New York. —Advertisement.

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Old Time Telegraph Reminiscences

By Robert F. Easson, Toronto.*

*Delivered before the Old Time Telegraphers and Historical Association's Reunion at Toronto, Ontario, last fall.

I engaged with the Montreal Telegraph Company, in this city, as messenger in 1849. That is seventy-one years ago, and I think I may be fairly entitled to rank as an "Old Timer." I was not quite twelve years of age when I entered the service. I am now in my eighty-third year. I sent my first message over the wires of the Montreal Telegraph Company in 1850. O. S. Wood, then Superintendent at Montreal, received the message. Mr. Wood, I may mention, was a personal friend of Professor Morse and his first student.

In the early days most of the operators in charge of Canadian offices were Americans, necessarily so, as the Morse Telegraph system was of American origin, and Canadians had to be initiated. When I joined the company, John Parsons, an American, had charge of the Toronto office and he and his wife occupied rooms in the same building in which the office was located. They were intensely American and loved the Stars and Stripes. They had no family, but presently Mrs. Parsons quietly journeyed to Buffalo and at the expiration of a certain length of time returned with a nice little baby. Parsons wouldn't tolerate a Canuck in his family. I had been with Parsons about a year when he resigned, and in 1850 H. P. Dwight was sent from Montreal to take charge of the Toronto office. Although seventy years have elapsed since that time I have pleasant recollections of his coming. My salary had been $1.00 per week, and his first notable, perhaps I should say laudable, act, was to increase it to $1.50 per week. At that time Mr. Dwight and myself comprised the entire working staff of the Toronto office. Mr. Dwight always insisted upon neatness and orderliness in his office arrangements; he also insisted upon punctuality in his assistant, part of whose duties was to light the grate fire in the morning. Matters were managed very economically in those days, and to facilitate "firing up," and perhaps save expenditure for kindling, I regularly brought to the office a quantity of chips from my own home each morning. I am afraid I sorely tried Mr. Dwight's patience by occasionally arriving behind time. One winter morning when I turned up somewhat belated with my bundle of chips under my arm, I was almost petrified to find Mr. Dwight sitting at a brightly burning fire reading the paper and everything about the office in perfect shape for the day. I took in the situation at a glance. Mr. Dwight had taken my place for that morning, and I felt very uncomfortable, but nothing was said until about noon. He then, in a quiet but firm manner, drew attention to my sins of omission and commission, dwelling at some length of what my indolent and unpunctual habits would lead to, and winding up by giving me the "grand bounce." I retired reluctantly to the hall, while a feeling of degradation and utter hopelessness crept over me. Before I got out of the building, however, Mr. Dwight came along and, after further admonishment, I was reinstated. In the course of a year or two I became a full-fledged Sound Operator.

In October, 1851, I was sent to Oshawa to relieve Dr. Irwin, operator at that place, who had been granted two weeks holidays to visit Dunkirk, N. Y. The stages of the "Royal Mail Stage Coach Line" started for Montreal daily at 12 noon from the corner of Front and Wellington Streets. I took passage in one of these stages and was dropped off at Oshawa. I returned by stage. A negro minstrel troupe happened to be fellow passengers and I'll never forget the heaps of rollicking fun we had. The four horses were changed every ten or twelve miles. At the Rouge was a well kept country inn. Liquid refreshments were amazingly cheap in those days, the charge being two pence per glass, Halifax currency, or a trifle less than five cents per drink. The charge was the same for whiskey or beer—Gooderham's whiskey, Flamboro West whiskey, Morton's Proof whiskey. These were the popular brands and all were the same price. I have it on the best authority that the tipple of those days was of a much superior quality to that obtainable at the present time, being pure and undefiled, without reproach, or a headache.

W. Weller, the proprietor of the Montreal line of stages, became interested in the International Telegraph Company, a line built in opposition to the Montreal Telegraph Company, and in this ill-advised venture was the bulk of his large fortune dissipated. John Bowman, grandfather of the celebrated New York hotel man of that name, was the Toronto agent for Weller's stages.

Early in the spring of 1853 I emigrated with my parents to Chicago. There were no railroads in Canada at that time, but we managed to reach Chicago by stage, steamboat and rail. The Michigan Central Railway was not quite finished into Chicago and dropped its passengers at a temporary landing ten or twelve miles out. From this point we were taken to the city in a wagon. Chicago and Toronto were then about the same size, Toronto being the cleaner and much more substantially built city.

Mr. Cornell, founder of the Cornell University, who held controlling interests in many of the telegraph lines in the Western States, happened to be in Chicago, and on presenting my credentials to that gentleman he, after a few pertinent questions, engaged me to go to work next day. I made myself generally useful in the Chicago office for a few days, when I was ordered to Detroit, where they were short-handed. Charles Wendell had charge of the Detroit office and his operators were C. S. Jones and Hen. Pratt. I put up at the Biddle House, the leading hotel, and as an evidence of the "newness" of the times, gas had not yet been intro-

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duced into this grand hotel, but I had an elegant wax candle to light me to bed every night. My mission to Detroit lasted about three weeks. At the end of that time I returned to Chicago where, I may state, the staff at that time did not exceed half a dozen regular operators, some of whom were yet unable to read by sound, and were still using recording registers. At this time all messages received over the wires were copied in pencil on plain paper and those for city delivery were re-copied by a clerk for this purpose. It may interest the ladies to know that we had a lady operator in those primitive days on the Cornell line at Waukegan, Ill., Miss Clark, a pretty girl about eighteen years of age, and a fairly good operator. I believe Miss Clark was the first lady operator in the Western States. It was not until about 1870 that lady operators were introduced into the Toronto operating room.

In the course of a few days I was again ordered off, this time to Laporte, Indiana, where I remained two weeks relieving a Mr. Milliken, who was editor of a paper, as well as operator at that place. Of course, I only relieved him of his telegraphic duties.

From Laporte I was ordered to Plymouth, Indiana, where I remained nearly a month, opening an office at that place and teaching the postmaster to telegraph. From Plymouth I was despatched to Logansport, Indiana, and here I tarried about five months. All this traveling about from place to place was by stage. I saw a great deal of the Hoosier country in this way. It was sparsely settled and abounded in game. The Wabash Canal ran through Logansport, and as there were no railroads, the canal was kept very busy, freight boats and packets being constantly on the move up and down. The line south from Logansport ran alongside the Wabash Canal. The next office south of Logansport was Lafayette, with Mr. Haas in charge. I took a trip down the Wabash in a packet and visited this pioneer in telegraphy. He had two sets of instruments in his office and read by sound. I left Logansport for Chicago late in the fall of 1853, having been absent about seven months. Chicago, henceforward, was to be my home and I was informed that my outside work had ended. Frank Speed, a son of J. J. Speed, Jr., succeeded me at Logansport.

The telegraph up to this time had not evolved either a battery man or a line repairer. During the winter of 1853 Mr. Cornell was around Chicago much of the time and that gentleman and myself often came down to the office on Sunday to clean the battery. It was a Grove battery of about sixty cups. The fumes arising from the sulphuric acid during the cleansing process nearly stifled us, and we frequently had to leave the room to get a breath of fresh air. We worked two lines from this battery. In Canada, up to that time, separate main batteries were employed for each separate line, and it was only after it had been learned that in Chicago, a number of lines were worked out of the same battery, that an attempt was made to do the like in Toronto. When I first arrived in Chicago all the lines entering the city were owned and controlled by separate companies. For example: The Cornell Lines, Speed Lines, O'Reilly Lines, Hotchkiss Lines, Illinois and Mississippi Lines, but they all centered in one general office, second floor, northwest corner of Clark and Lake Streets, Emery Cobb being local manager for all. I had been in Chicago about a year when Mr. Cobb had a heated altercation with Mr. Cornell arising out of the question of right of possession. This wrangle led to a savage fisticuffs engagement, in which neither of the combatants were vanquished, but as a result of the battle, of which I was a witness, Mr. Cornell had to seek other quarters. Rooms were secured in the same building upstairs and there we set up business for ourselves, with John Draper as local manager. Our new premises proved to be unsuitable, and we shortly moved downstairs to the ground floor of the same building, with the entrance to our office on Clark Street. For advertising purposes the instruments were placed close up to the window and attracted much attention. I have seen a dozen people at a time gazing in watching me send or receive messages.

I never knew Mr. Cornell to send or receive a message, or do any work at the instrument, but that he could read by sound I had ample proof. The line to Toledo had been down for a couple of days —no unusual occurrence. When it came O. K. a good-sized pile of messages were waiting to be forwarded. Mr. Cornell was sitting near the instrument table and I was ambitious to show him how quickly I could reduce the pile and, to expedite transmission, among other vain tricks, I omitted the full stop, or period, at the end of the address. Mr. Cornell listened for a while, then deliberately walking over to my table said: "Now, I know you are a pretty good operator and good sender, but you should put in the period at the end of the address. It's the rule and must be observed." This was a "sockdologer." Instead of being complimented for my fast work, as I anticipated, I was called down for not obeying the rules. Mr. Cornell was very sociable and communicative. He was probably as well informed as regards all kinds of telegraphic appliances, wire connections, galvanic electricity, etc., as anyone engaged in the business at the time, and his conversation was exceedingly interesting and profitable. It is said of him that as an unprejudiced, practical man, he became familiar with the uses of electricity while the professor was lecturing upon its dangers. After I had been with him a year and a half I signed an agreement to work for him another year, that is, from the 1st of November, 1854, to 1st of November, 1855, at a salary exceeding twice the amount he started me with eighteen months previously. This agreement, written by himself in duplicate, covered one whole sheet of foolscap and bristled with whereases, provisos, conditions and penalties. How Mr. Cornell, with his multifarious duties and complicated busi-

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ness engagements, ever found time to write two such documents puzzled me, but in all things he was methodical and thorough. He said to me one day: "Although I employed you when you first came to Chicago, I was not then specially in need of an operator, but I had three reasons for engaging you. First, because you came from Mr. Woods' (Montreal) line. Second, because you had a good recommendation from Dwight, and, third, because you were a Scotch boy." Mr. Cornell was forty-six years of age when I knew him, but the worries and anxieties of an unusually busy life had deepened the furrows in his smoothly shaven face, and he looked older.

(*To be Continued*)

The Telephone and Telegraph Monopoly in Foreign Countries

[The Berne, Switzerland, Telegraph Union has recently issued a compilation, from which the *London Telegraph and Telephone Journal* has printed the following interesting extracts.]

This useful compilation, which contains a digest, and in many cases the text, of the telegraphic and telephonic laws of forty countries, we do not propose to review in the ordinary way, but rather we shall attempt to extract from it some facts and data for the instruction, and, if possible, edification of our readers. It covers the whole field of telegraphic legislation, dealing with monopolies, sublicenses, royalties, wayleave rights, protection of lines, etc., and would prove an invaluable basis for a comparative treatise of the practice of state telegraph administrations. Over 160 pages are occupied by the enactments of the United Kingdom, ranging from the Telegraph Act of 1853 to the Acts of 1899, 1904 and 1907.

"The study of British legislation in telegraphic matters," says the compiler, "is of particular interest by reason of the special conditions to which the telegraphs of the United Kingdom have been successively submitted in their origin, in their development, and in their transfer. In Continental countries this new mode of communication having been instituted by the State from the beginning, legislation was obliged to regulate the principal conditions of its establishment and working in a more or less complete manner. In England, on the contrary, where the establishment of the telephone was long left to private industry, the legislative authority did not have to intervene until the service had attained to a considerable development when in the general interest the State judged it useful to assign it to the post office." Then, accompanied by explanatory paragraphs, follow excerpts from the various acts bearing on the purchase of the telegraphs, the establishment of the monopoly, the protection of lines, and the purchase of the telephones.

The compiler records the Attorney General's judgment of 1880 that "the telephone is a telegraph in the sense of the laws of 1863 and 1869." It is interesting to note that this opinion was not confined to British lawgivers. Immediately after the invention of the telephone, the German Government announced their opinion, maintained ever since, that this means of communication was a subgenus of telegraphy and within the competence of the Empire. This was confirmed by the law of 1892 in which it was expressly stated that the expressions "telegraphic establishments" comprised also telephones. In France it was held that the laws which conferred a telegraphic monopoly on the State referred not only to electric telegraphy, but to all distant transmission by signals by any means whatsoever. Concessions were granted to companies in 1879 to establish telephone systems in Paris, Lyons, Bordeaux and Marseilles, but a law was passed in 1889 authorizing the purchase of these systems, since which date the telephone has been a state monopoly. The Belgian Government also claimed that the telephone service came under the telegraph law of 1876. On the invention of the telephone they authorized the construction of telephone lines at the demanders' risk and peril under payment of a tax, and in 1883 their monopoly was fixed by law. Certain exchanges were constructed by licensees and repurchased 1893-96, and others were exploited by the State itself. In Austria, also, where telegraphic monopoly was conferred by a law of 1847 the telephone service was first established by licensees and acquired by the State 1893-95. In Switzerland the law of 1889 decreed that the exploitation of telephones formed part of the telegraphic service (monopoly conferred in 1851). In Russia the law of 1881 lays down that telephonic communication forms part of the telegraphic monopoly (conferred by the law of 1855). In Sweden there is neither a telegraphic nor a telephonic monopoly, but a law of 1906 provides that no company or person may establish telegraphic or telephonic communication on crown lands, public roads or railways without royal sanction. The telegraph and telephone service is, however, chiefly in the hands of the State. As regards Denmark, an Act of 1897 permits the Minister of the Interior to grant telephonic and telegraphic concessions of a maximum duration of twenty years.

State telegraphic monopolies are of long-standing in Europe. That of Austria dates from 1847, Belgium from 1850, France from 1851, Switzerland 1851, Sardinia 1853, Russia 1855, and Great Britain 1869. Telegraphic communication was regulated by the State in Holland as early as 1852 and in Prussia and the North German States before 1851. By the year 1853, therefore, the lines of all the States of continental Europe which possessed a telegraphic system of any importance (i. e., France, Belgium, Holland, North and South Germany, Austria, Northern Italy and Switzerland) were under State control.

As we have shown, this monopoly was generally held to include the telephone, when that means of communication was introduced to the public. In some countries the telephonic monopoly was specifically confirmed by subsequent legislation, in others not.

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY.

By Louis Casper

Lesson 31

The subject in this and the next succeeding lesson deals on two properties that have a wide significance to those that have to deal with telegraph transmission. These properties are Electromagnetic and Electrostatic Induction. The underlying principles governing the latter are important; first, in that they relate fundamentally to the causes and effects of certain electrical phenomena; and second, due to the effects produced by such induction on parallel conductors.

It is well known that the effects of induction upon many parallel lines and cable conductors are formidable factors in the prevention of attaining the maximum transmission possibilities of such wires. It has been known on some circuits that the theoretical carrying capacity of the latter have been cut from twenty to forty per cent., and in some instances the percentage was still greater because of such influences

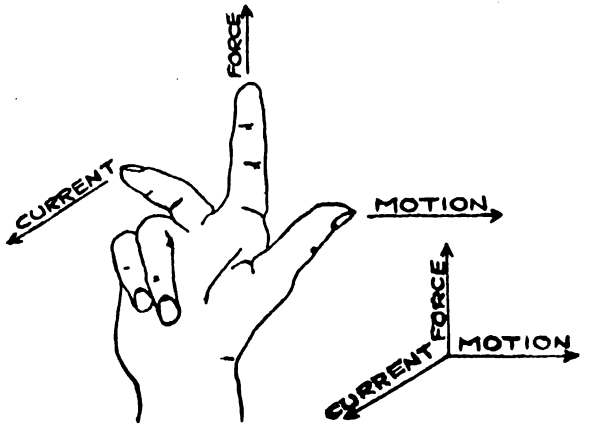

FIG. 83

Relation Between Magnetism and Electricity

In the preceding lesson it has been demonstrated that whenever a current flows through a conductor a flux of lines of magnetic force develops in the neighborhood of the conductor; or in other words, *a current of electricity* in motion produces magnetism. This process is, in a measure, reversible. That is, a flux of magnetism can, by proper manipulation be made to produce a current of electricity. We have learned that the first requirement, if a current of electricity is to be made to flow, is the production of an e.m.f. It follows, then, that if it is desired to circulate a current of electricity by means of a magnetic flux, the first step must be to generate an e.m.f. by means of that flux, and if the e.m.f. thus generated be impressed on a closed circuit, a current of electricity will be driven around the latter. In this way, a flux of magnetism can be made to propagate an electric current.

Electromagnetic induction is that phenomenon whereby an e.m.f. is induced in any conductor that "cuts across" or is "cut" by a magnetic flux. "Electromagnetic induction" must not be confused with *electrostatic induction* or *magnetic induction.* These latter two properties are entirely different, although related phenomena.

The principle of magnetic induction is of great commercial importance because on it depends the operation of dynamos or generators. Electrical energy can be developed with generators more cheaply than by any other means, and at a much lower cost than by primary cells, and for this reason is almost universally employed in the telegraph service. If magnetic induction had never been discovered, and it were necessary to depend on primary cells for the generation of electrical energy, it is obvious that the use of electricity would be exceedingly restricted. The distribution of electric energy would not be commercially possible were it not for the principle of magnetic induction, because it is on this principle that transformers also depend for their operation. Without transformers long distance power transmission would not be feasible.

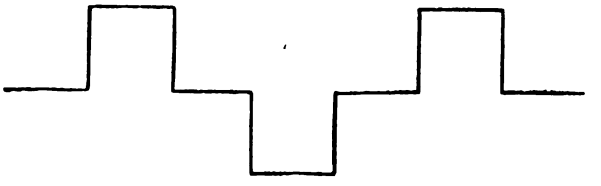

FIG. 84

We have stated that electromagnetic induction can be referred to two causes. One cause is the "cutting" of lines of force by conductors. This generally, as far as effective, has the result of changing the number of lines of force threading the circuit. The other way is to directly change the number of lines of force threading the circuit, without reference to "cutting" them by conductors. We may change the term "cutting the lines of force by conductors" by stating—"That when a magnetic flux within a loop of wire varies with the time an e.m.f. is induced in the loop," or it may be said, "Whenever the number of magnetic lines linking a circuit is changed an e.m.f. is developed in the conductor forming the circuit."

The idea of "cutting of lines" appears preferable to that of "variation of flux" or "linking of flux," because it seems that the idea of "cutting" is the more readily understood.

Furthermore, a complete loop or circuit is not necessary for the development of an e.m.f. An e.m.f. can readily be induced in a short straight piece of wire not forming a closed circuit and not connecting to anything. However, no current can flow unless the e.m.f. thus induced is impressed on a closed circuit.

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If a telegraph wire was carrying a steady current and was set swinging by the wind, it would carry with it its field of force which would also swing back and forth. Theoretically, there would be no limit to the inductive diameter of such field of force, but its most intense field would be within a limited radius from the conductor as an axis. This field, swinging back and forth, would sweep its lines of force across any contiguous conductor, and if the ends of the latter are looped or grounded, currents of brief duration would be caused to flow back and forth through it. Thus every swing of the line wire, however slight, produces some current upon its neighboring wire or wires.

The varying currents in a telegraph wire, as Morse or automatic signals are sent through it, make fields of force and set up pulses of electromotive force with consequent variable electromagnetic currents in contiguous conductors.

Interference of telegraph signals one circuit with another or from power circuits is a very familiar example of this phenomena.

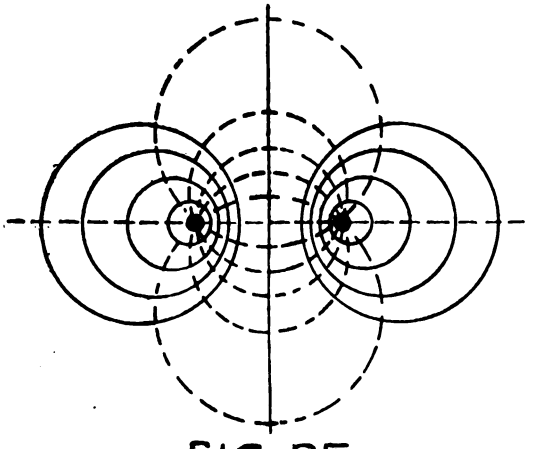

FIG. 85

LAWS OF INDUCTION

There are several laws affecting electromagnetic induction which may be given here.

FARADAY'S LAW is based on his discoveries in the induction of currents by the cutting of lines of force. It is given in the following words:

"When a conductor is moved in a magnetic field so as to cut the lines of force, there is an electromotive force impressed on the conductor in a direction at right angles to the direction of the motion, and at right angles also to the direction of the lines of force."

FLEMING'S RULE for remembering this law and the connection between the three factors, motion, magnetism and induced electromotive force, is this: Hold the thumb and first finger of the right hand at right angles to each other. Let the forefinger represent the lines of force and point in their direction. Then the hand will represent the north pole of a magnet. The thumb will represent the direction of movement of a conductor. The latter is represented by the middle finger pointing at right angles to the other two. Then moving the conductor in the direction of the thumb, an electromotive force in the direction in which the finger points will be impressed upon it.

The words "current induced" may be substituted for "electromotive force impressed." When direction is attributed to electromotive force it refers to the direction of current which such electromotive force would produce.

The cut, fig. 83, shows the relations of the three factors as described.

AMPERES RULE ADAPTED TO INDUCTION.—Suppose a man swimming along a conductor with his back to the north pole of a magnet whence lines of force issue. Then if he and the conductor together be moved toward his right hand, the induced current will flow in the direction in which he is swimming.

When the movement is not at right angles to the lines of force a certain proportion of the movement can be found which will be at right angles, and this represents the effective portion of the movement. The object of the adoption of the idea of perpendicular movement is for the sake of simplicity.

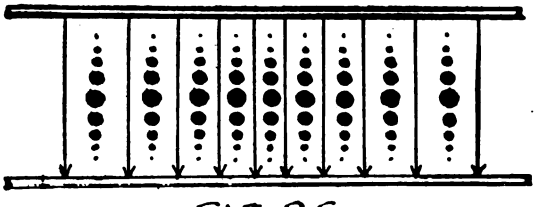

FIG. 86

CLERK MAXWELL'S RULE.—If a magnet is in the presence of an active circuit which therefore produces a field of force, each portion of the circuit acts upon the magnet in such a direction as would cause the magnet, were it free to move, to take up the position in which the greatest possible number of its lines of force would be embraced by the circuit.

LENZ'S LAW is a most convenient statement of the relations between the motions of magnetic poles and currents induced by their lines of force. While such relations can be worked out from a lower basis, the summarization known as Lenz's law will be found an admirable tool to work with; but it is advised that students of these lessons had best take this law with due limitation in that it only applies to the relations of electromagnetic induction to mechanical motion, causing it or produced by it. It is not good practice to try to stretch it to cover induction where there is no mechanical motion. It is also all-essential to understand that it is in strict accord with Ampere's law. It is generalized thus: "Whenever a closed circuit, capable of bearing an electric current lies wholly or in part in a magnetic or electromagnetic field of force, any disturbance in the intensity of the field of force will induce a current in the circuit; and the direction of the in-

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duced current is determined by the rule that the new current will increase the already existing resistances (not electrical, but mechanical resistance) or develop new resistance to that disturbance of the field which is the cause of induction."

The law is more briefly expressed thus: When a conductor is moving in a magnetic field a current is induced in the conductor in such a direction as by its mechanical action to oppose the motion.

Fleming, in his book on the "Propagation of Electric Currents in Telephone and Telegraph Conductors," admirably describes the propagation of electromagnetic waves along wires, which stripped of mathematical formulas are described here in part:

Let us suppose a telegraph polechanger to be applied at one end of a line giving an electromotive force which rises suddenly to a certain value, maintains it constant for a while, then vanishes and is shortly afterwards replaced by a reversed electromotive force going through the same cycle of values. The curve of electromotive force or the variations of e.m.f. with time would then be represented by a square-shouldered curve, as in fig. 84.

If, then, the e.m.f. rises suddenly at one end of the pair of wires it implies that there is an electric force, and therefore an electric strain, in the space between. Looking at the wires end on, the strain would be distributed in curved lines as in fig. 85, where the small circles marked with a dot and a cross represent the section of the wires. When looked at from the side the lines of electric strain would project into straight lines as in fig. 86, in which the arrow heads represent the direction of the electric strain. Now, this strain does not make its appearance at all distances at once, but is propagated outwards in the space between and around the wires at a certain speed, and when the electromotive force at the sending end dies down suddenly it does not cease at all points at once. The effect is equivalent to a gradual movement of lines of strain along the space between the wires. This movement implies movement of electric charges along the wires. The ends of the lines of electric strain, so to speak, slip along the wires, and we may regard their ends as terminating on electric charges. But this lateral movement of lines of electric strain and of longitudinal movement of electric charges implies the flow of an electric current along the wires and the creation of lines of magnetic flux in the interspace, which lines of flux are everywhere perpendicular to the lines of electric strain and the direction of the motion of the latter. The lines of flux are therefore closed loops embracing the wires as shown by the dotted circles in fig. 85 and their section is represented by the dots in fig. 86. The two distributions of lines of strain and flux travel together, and they both represent energy in different forms. As stated before, fig. 85 is an end view of lines of electric and magnetic force of parallel wires. Firm lines are magnetic lines, dotted lines are electric lines.

(*To be continued*)

European Newspaper Reports by Radio

American newspapers and news agencies are using wireless as their main means of communication from France and Germany, writes Robert Donald in the *London Daily Express*. The following few particulars will show what is now being accomplished:

The *Chicago Tribune* sends an average of 1,000 words a day by wireless from France and Germany direct to its own receiving station in Chicago. The *Philadelphia Public Ledger* sends quite as large a volume of news by wireless, and has also its own automatic receiver installed at Philadelphia. The *New York World* relies exclusively on wireless from France. The *New York Herald,* the United Press, the International News Service, and the Central News of America all get news from France by wireless. The *New York Times,* which gives prominence to European news, also relies on wireless for news from France and Germany, and receives the messages at its head office in New York. Altogether, from France alone, a service of over 10,000 words is radiated every day to American newspapers and news agencies, and about the same number of words from Germany. The rate from France is 58 centimes per word. The American correspondents are perfectly satisfied with the service, both as regards speed and accuracy. The messages are filed between six and eight o'clock at night, and are received in the United States in about two hours' time. There is rarely delay, and the correspondents do not complain of repetition or mutilation.

Paris, working with the high-power station at Bordeaux, is becoming the chief clearing house for European news for America. News is now collected from Italy, Spain, Southern Europe, and the Mediterranean for transmission from France to America, and one leading American journal has begun to send the messages from London to Paris for transmission to America by wireless. The inconvenience which exists now by having the despatching station at Bordeaux will be remedied when the new high-power station at Sainte Assise, near Paris, is operating.

The stations which send news to America are also, of course, used for commercial purposes.

———o———

Telegraphs in Peru

Sir William Slingo, the well-known British authority on postal, telegraphic and radio matters, has been named Controller-General of the Postal, Telegraphic and Wireless Services Administration Company, subsidiary of the Marconi Wireless Telegraph Company of London, and has taken over the administration of the said services in Peru from May 1 last, under contract with the Peruvian Government. Sir William Slingo has introduced up-to-date British methods into the new postal administration of Peru, and his staff is composed of British working under his direction.

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EDITORIAL COMMENT

To Combine Government Wire Services

The first step in the Administration's policy of reorganizing and consolidating Government activities will relate to the various communications service. Under this plan outlined, commercial radio and all telephone and telegraph business of a general character will be concentrated under the Post Office Department. Legislation will be required to effect the necessary changes, and Postmaster General Hays has appointed a committee, headed by R. B. Howell of Nebraska, to report a system of consolidation. The committee will go to Europe to study the question.

One great cost to the Government is "broadcasting" market reports and other information for general circulation. Radio and telegraph are employed in this work. Market reports of the Agricultural Department are now "broadcasted" by the Post Office Department. Weather reports are also to be sent out through the central office.

Under prevailing conditions, each department has its own force of telegraphers, and some lease lines from private telegraph companies. It is said that telegraph operators are idle for a good part of the time in some departments, whereas if there were a central office, operators could be kept busy constantly.

The proposed central office will be known as the Bureau of Communications. Its radio business will embrace all that is not purely military.

Knights of the Key

You recall the days when the arrival of a telegram frightened a woman so much she was scared to open it, afraid some one was dead.

This fear is rapidly dying out, says a Western newspaper. Telegrams are common. Night letters total millions yearly.

The most marvelous or fearful things grow commonplace through wide usage.

Telegrams have become so ordinary that few of us ever give a thought to the telegraph operator. He seems a humdrum, mechanical existence. Yet no trade or profession ever produced more unique, useful and devoted characters.

You owe a lot to the telegraph operator. For one thing, the telegraph news you read.

Often you read about some telegraph operator who has risen to the presidency of a railroad. Thomas A. Edison, the inventor, for years was a "knight of the key." So were Frank Munsey, William Gillette, George V. Hobart and Andrew Carnegie.

"My Friend from India," one of the best American comedies, was written by a telegrapher—Harry A. Desouchet. You know the "Evolution" poem which starts, "When you were a tadpole and I was a fish." Written by Langdon Smith, once telegraph operator for the United Press.

So they go, on the roll of fame, into the thousands.

A veteran operator was John M. Carnahan, who began handling a key in 1861. In 1876 he was operator at Bismarck, N. D., then the farthest-west wire station. Stopping for only brief intervals Carnahan sat at his key for nearly eighty hours and "sent" the story of the Custer massacre, a time feat that, it is said, has never since been duplicated.

At the time of the great Galveston flood, wires were down and there was no way to get relief appeals to the outside world.

Richard Spillane, a former telegraph operator, now one of the highest paid writers in Philadelphia, was managing editor of a Galveston newspaper. In an old steam launch, assisted by a cotton broker, Spillane defied the hurricane, crossed the bay and, reaching land, tramped on through the night into Houston. There he got to a key and for hours wired appeals for help, followed by news stories of the flood.

He had made the trip in carpet slippers. Their dye soaked out and poisoned his feet, which were so swollen that when he finished telegraphing he had to be lifted out of his chair.

The details of Spillane's dash for help make the movies seem tame. But it's typical of the men who have given the world its telegraph news and personal wire messages since Samuel Morse invented the telegraph.

English Deficits

In the midst of the national protest against the increased postal charges that have just gone in operation in England, a very remarkable admission has been made by the Postmaster-General.

These increases, he says, are not necessary because there is a loss on the postal service, but because the telephones and the telegraphs are not paying their way!

By charging twopence for the postage stamp that used to cost a penny in pre-war days and a penny for the old halfpenny stamp, the postal authorities will make this year a handsome profit of £800,000. Not content with that, the authorities have decreed that the public must pay still more for their stamps, because branches of the Post Office that are in no way connected with letters are being run at a loss to the State of more than eight million pounds.

The Postmaster-General's admission to this effect has been received in many quarters with astonishment, for it is maintained that each service should stand on its own.

It is apparent that wage readjustments, so far as the rate of wages paid is concerned, are not being carried out on a scale that promises an early return to normal.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

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Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

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The HUDSON word counter counts up to 1,500 and is admirably adapted for press work as well as messages. This word counter has been on the market for over twenty years and has stood the test of time. Some of the original HUDSON word counters are still in every-day use, which testifies in the strongest terms to their value and lasting qualities. The HUDSON word counter costs $7.00.

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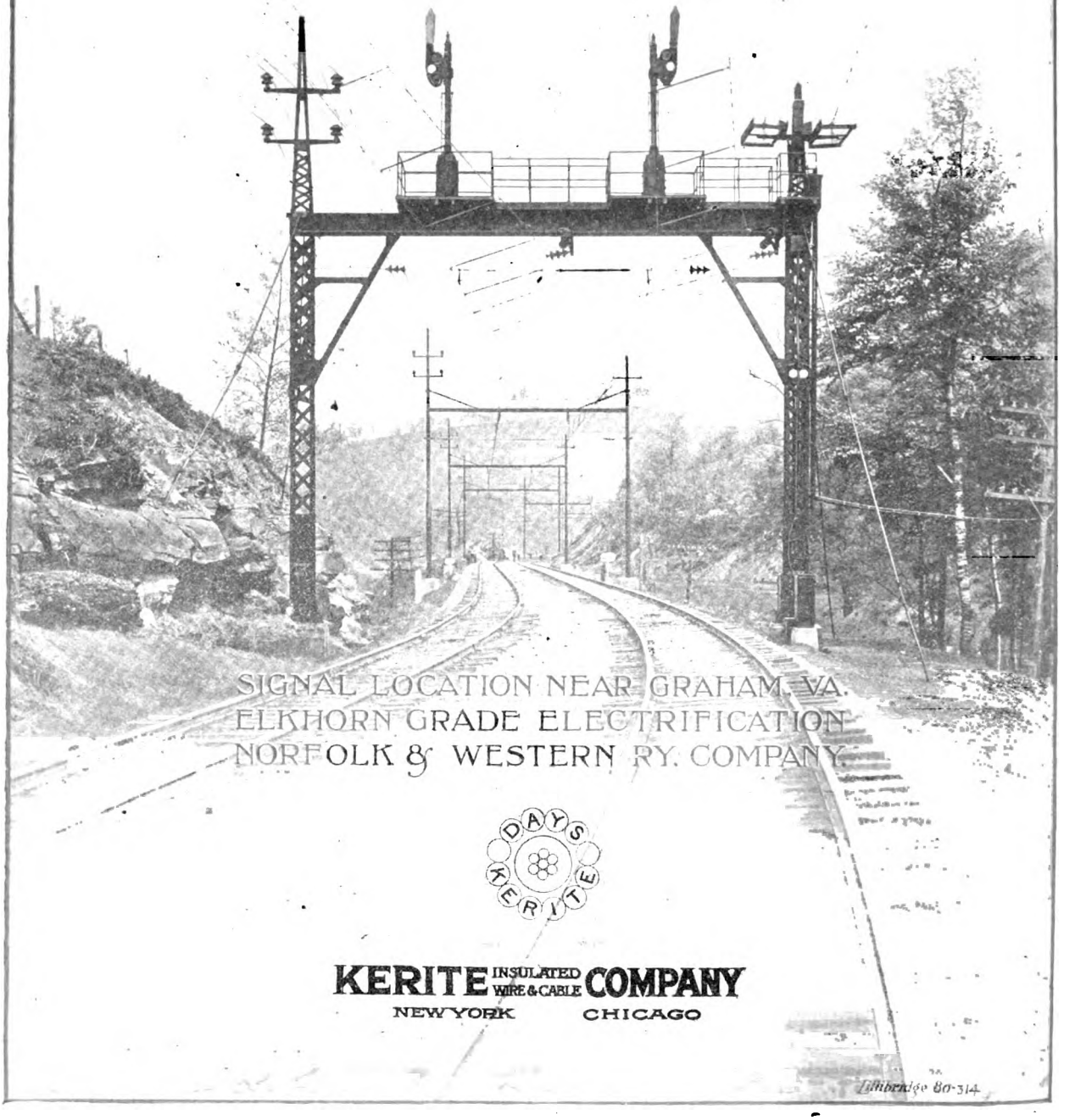

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THE RAILROAD

Committee of Arrangements, Telegraph and Telephone Section of the American Railway Association

Committee No. 13—Arrangements, of the Telegraph and Telephone Section of the American Railway Association, held a meeting in New York on July 11th, to make the necessary arrangements for the annual meeting of the section to be held at the Hotel Cleveland, Cleveland, Ohio, September 21st, 22nd and 23rd. The detailed program was gone over and found to contain many interesting items in addition to the usual arrangements for such annual meetings, details of which will be given to the membership by circular letter in due course. This committee is composed of R. F. Finley, superintendent of telegraph, New York Central Lines, Cleveland, Ohio, chairman; J. A. Jones, superintendent of telegraph, Southern Railway, Charlotte, N. C.; E. C. Keenan, general superintendent telegraph, New York Central Lines, New York, and B. A. Kaiser, railway representative of the American Telephone and Telegraph Company, New York.

It is understood on the authority of the committee of arrangements that the Telegraph and Telephone Appliance Association is going to canvass with its membership the question of exhibits at this meeting. If a sufficient number of supply people indicate their desire of having an exhibition of telegraph and telephone appliances, it is thought that the Association may arrange for a large room adjoining the meeting hall at Cleveland in which to exhibit appliances of special interest. Definite announcement as to the conclusion regarding these exhibits will be made on or about August 1st.

W. T. Kyle, of the Page Steel and Wire Company, Grand Central Terminal, New York, is chairman of the Telegraph and Telephone Appliance Association.

Telegraph and Telephone Section of the American Railway Association, Cleveland Session

H. Hulatt, chairman; W. A. Fairbanks, secretary, and J. E. Fairbanks, general secretary, have issued the following circular to the representatives of members and affiliated members of the Telegraph and Telephone Section of the American Railway Association.

The Fourth Session (annual meeting) of the Telegraph and Telephone Section will be held at Hotel Cleveland, Cleveland, Ohio, Wednesday, Thursday and Friday, September 21, 22 and 23.

The first day's session will convene at 10 a. m.

The reports of the following committees will be presented:

Committee of direction (business transacted since last session).

Committee No. 1—Construction and Maintenance—Outside Plant: Sub-Committee "A"—Construction and Maintenance of Pole Lines; Sub-Committee "B"—Wire Crossings; Sub-Committee "D"—Transpositions.

Committee No. 2—Construction and Maintenance—Inside Plant: Sub-Committee "G"—Apparatus and Materials; Sub-Committee "H"—Location and Layouts; Sub-Committee "J"—Circuits and Current Supply; Sub-Committee "K"—Installation and Maintenance.

Committee No. 3—Protection Against Electrolysis.

Committee No. 4—Protection Against Lightning or Electric Light and Power Circuits.

Committee No. 5—Telegraph and Telephone Development.

Committee No. 6—Message Traffic.

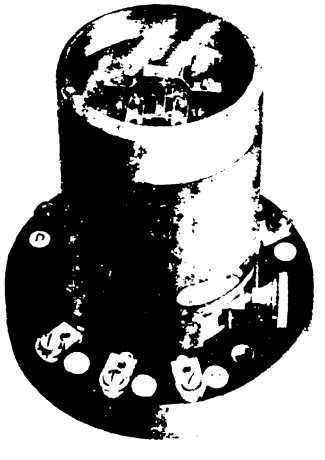
Committee No. 7—Inductive Interference.

Committee No. 9—Future Activities and Topics.

Committee No. 10—Technical Training.

Committee No. 11—Telephone Transmission.

Committee No. 12—Radio and Wired Wireless.



Wheatstone Type Polar Relay.

It is protected from dirt and moisture by a cover which totally encloses it, but which is readily removable.

The contact points are platinum.

It is particularly adapted to high speed operation with minimum current.

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Committee on Nominations.

Committee of Direction—Nominees for Committee on Nominations.

A paper will also be presented by Stanley Rhoads, telegraph and telephone engineer, New York Central Lines, New York, entitled, "Some Phases of Railroad Telegraph and Telephone Enginering."

Officers, members of Committee of Direction and Committee on Nomination will be elected at the session.

All members are requested to arrange to be properly represented at the session.

A COMMITTEE on Editing, consisting of W. A. Fairbanks, L. S. Wells and J. F. Caskey, met in the office of the Secretary of the Telegraph and Telephone Section of the American Railway Association, New York, on June 8th, to give consideration to the publication of the manual, which it is hoped will be issued within a few weeks.

The Annual Report of the Telegraphy and Telephony Committee of the American Institute of Electrical Engineers, which is printed elsewhere in this issue, furnishes a great deal of valuable information on the subjects treated, and we are sure that our readers will appreciate reading this valuable and timely report. The Committee is to be congratulated on the thoroughness in which it undertook in carrying out the objects of the Institute, and everyone interested will thank the committee for their splendid work. Our readers now have before them a summary of the achievements in the telegraph, telephone and radio industries, which is invaluable from every point of view.

THE California Railroad Commission has set July 15 for a hearing at San Francisco in the matter of the proposed uniform standards of overhead line construction applying throughout the state.

RECENT New York visitors: R. F. Finley, superintendent of telegraph, New York Central Lines, Cleveland, Ohio.

Death of George H. Groce

George H. Groce, aged fifty-seven years, from 1904 to 1910 in general charge of the telegraph, electrical and signal departments of the Illinois Central System at Chicago, died at the home of his sister in Fulton, Ky., on June 29th, and the remains were interred at that place. Mr. Groce was born at Tarentum, Pa. He entered the telegraph service at sixteen years of age and filled positions of telegraph operator, agent, train despatcher, chief operator and division superintendent on various railroads. Since leaving the Illinois Central service he has been interested in several commercial enterprises along electrical lines. His death was due to paralysis, which had been coming on gradually for the past year, although he was active up to five days before his death. Mr. Groce was unmarried.

Obituary.

DR. HARRY BARRINGER COX, aged fifty-seven years, a well-known inventor of electrical devices, died at Los Angeles, Cal., on June 30th. He was the inventor of a dry cell battery and contributed many electrical inventions to science, including the submarine signal system for coast defense, an electric push button, a system of wireless telegraphy using the ground instead of the air, and a device later incorporated in the railway block safety system.

ELWOOD FRANKLIN REEVES, aged fifty-nine years, secretary and treasurer of the Keystone Telephone Company, Philadelphia, Pa., died on June 8th, after an illness lasting several months.

PROFESSOR Francis B. Crocker, aged sixty years, founder with Dr. S. S. Wheeler of the Crocker-Wheeler Electric Company, Ampere, N. J., in 1888, died at his home in New York on July 9th. Professor Crocker was one of the best known members of the electrical profession. He was the founder and head of the School of Electrical Engineering of Columbia University and first chairman of the standardization committee and a former president of the American Institute of Electrical Engineers.

The Jester-Cooper Repeater

Telegraph and other engineers should remember that J-C Repeaters, which are advertised in another column, have after many years of service proven beyond question their dependability under all operating conditions. Write to the Jester-Cooper Company, P. O. Box 924, Houston, Texas, for descriptive literature.—Advertisement.

The Back Stage Side of the Wire Business

Thomas S. Brickhouse, manager of the wire department of E. F. Hutton and Company, New York, has written an article which appeared in *Commerce and Finance* for June 22nd, under the title of "The Back-Stage Side of the Wire Business." The story of the "Leased Wire," which occupies several pages of space, is fully illustrated, and it is interesting from every point of view.

Mr. Brickhouse, who is the holder of the Carnegie Diamond Medal, won at the San Francisco Telegraph Tournament in 1915, has devoted many years to brokerage leased wires and is an exceptional authority on this class of service.

Among the illustrations shown in his article are the Private Wire System of E. F. Hutton and Company and Connections; Wire Room of Thomson and McKinnon, Chicago; Private Wire System of Guaranty Trust Company; Private Wire System of J. S. Bache and Company; Wire Room of H. and B. Beer, New Orleans; Private Wire Systems of Hodenpyl, Hardy and Company, Inc., and Connections, and Private Wire Systems of Pynchon and Company and Connections.

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Reporting the Big Scrap by Wireless Telephone

How the Radio Corporation of America Performed One of the Most Unique and Spectacular News Services of Modern Times

While Referee Harry Ertle counted "one, two, three, four, five, six, seven, eight, nine," and finally the fateful "ten," more than 300,000 "ear witnesses" to the big Dempsey-Carpentier fight on July 2nd were breathlessly "listening-in" and hearing the same words by means of their radio telephone receiving apparatus. These amateur and professional radio men were located on land and sea at points far removed from the fight arena. In fact, practically every radio fan in New Jersey, New York, Pennsylvania and other surrounding States was at hand, as well as nearby friends and neighbors to hear for the first time the returns of an international sporting event by radio telephone. Then, too, many stations caught the words and in turn relayed the news farther on to more remote points, so that the event was heard throughout the United States from coast to coast in the same unique manner. In addiion to the amateurs, hundreds of vessels, near and far from New York harbor had also "tuned in," and passengers and crew alike heard, not meaningless telegraphic signals, but the actual voice of the radiophone reporter announcing in the same manner as an eye witness would, the essential features of what was going on in the arena.

This scientific feat, which marks a new era for radio telephony, was made possible by the combined efforts of the General Electric Company and the Radio Corporation of America. The first organization, by furnishing the necessary apparatus and the second by installing and placing the set in operation and performing the multitude of details which this feat involved to make it a success.

In recent years much has been said concerning the wonders of wireless, but the "stunts" mentioned were in most instances isolated cases which did not particularly benefit any great number of people or mean much to the average person. This latest project, however, was singularly unique in that it gave out timely news to thousands of Americans without the thought of mercenary remuneration. It is probably the greatest achievement of radiophone broadcasting up to date.

The project was primarily devised to help the Committee for Devastated France as well as our own Navy League.

The Apparatus

The central radio telephone transmitter was located at the Delaware, Lackawanna and Western Railway station, Hoboken, N. J., utilizing the great steel tower which this railroad used some years ago in its train-dispatching-by-wireless system. The apparatus consisted of a 1500 watt radiophone transmitter employing six 250 watt Radiotron vacuum tubes. These vacuum tubes, by the way, are the lamps which have well nigh revolutionized the radio field and which directly make radio telephony possible today.

A special motor-generator was erected near the set, which furnished a potential of 2000 volts necessary for the plate excitation of these vacuum tubes. The filaments of the tubes were heated by means of a separate low voltage winding arranged on the machine. The vacuum tubes and all other auxiliaries are contained in one unit, the panel of which contains all necessary switches for power control and wave lengths. The set was built by the General Electric Company expressly for the Radio Corporation.

The Antenna

The antenna was stretched between the skeleton steel radio tower and the clock tower of the Delaware, Lackawanna and Western terminal. It is of the "T" type and consists of four No. 14 standard phosphor-bronze wire, 450 feet long, with a 250-foot lead-in. It has a natural period of 740 meters and spreads about 250 feet above the ground. This antenna was energized by a current of 15 amperes furnished by the transmitter, which, in radiophone circuits, is considered a great deal of current to radiate in the air. The wave length to which it was necessary for radiophone receivers to tune up to was 1600 meters.

How the Feat Was Accomplished

The actual reporting was done in the following manner: D. Sarnoff, general manager of the Radio Corporation of America, and J. A. White, editor of *Wireless Age*, were located at the ringside in the press stand, and took turns at reporting the most important features over a private telephone wire furnished for the occasion through the courtesy of the American Telephone & Telegraph Co., leading direct to the radio room at the Lackawanna terminal. The news was given round by round and incident by incident, and at the other end were typed directly from the telephone and handed to the radiophone operator, J. O. Smith, a well-known radio amateur, in the form of bulletins. The latter immediately spoke into the regular mouthpiece on the radiophone panel, so that hardly a minute was lost between the actual incident and the spoken voice in the air.

Several thousand letters have since been received by the Radio Corporation from amateurs located up to distances of five hundred miles from the scene of action, reporting the unusually clear voice of the speaker and enthusiastically voicing their approval of the success of the experiment, for it was the first time in the history of radio that the results of a boxing match were broadcasted by radio telephone.

A telegraph operator in England has just won the golf amateur championship of that country.

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PERSONAL

J. McMillan, general manager, Canadian Pacific Railway Company's Telegraph, accompanied by Mrs. McMillan and their daughters, Hazel and Myrtle, sailed on July 1st, on the steamer *Melita,* for a tour through England, Scotland and France. Mr. McMillan was born in Liverpool and came to Canada at the age of sixteen, and naturally expects to derive a great deal of pleasure in visiting the scenes of his boyhood. During Mr. McMillan's absence W. J. Camp will be acting general manager of telegraphs for the System.

Morris Ruberg, of the American Telephone and Telegraph Company, Philadelphia, Pa., who a short time ago went to Havana, Cuba, has returned to Philadelphia, and resumed his old position with the American Telephone and Telegraph Company.

POSTAL TELEGRAPH-CABLE COMPANY

C. A. Comstock, assistant to the general manager, has just returned to his desk after a brief vacation.

F. J. Kernan, auditor, who has been absent from the office for some time on account of sickness, has not yet been able to return to duty. He is now at his summer home at Morristown, N. J.

D. F. Mallen, formerly manager of the general operating department, New York, has been transferred to the office of J. J. Whalen, as traffic inspector. Mr. Mallen is succeeded by E. A. Coney, manager of the operating department.

Extensive alterations have been made in the quarters of the auditing department. The space formerly occupied by three private rooms on the Murray Street side of the building has been added to the room originally occupied by that department, thereby very greatly extending their space. The New York City credit department has been transferred from the ninth floor and is now a part of the auditing department.

J. P. O'Donahue, assistant chief engineer, is absent on vacation.

The new line which the company is building south from Temple to San Antonio, Texas, is nearing completion. Underground work in Austin has been finished, making it possible to extend the company's long distance telephone service at that place.

Walter B. Schreiber, manager of the 20 West 45th Street office, who is a lieutenant in the Signal Corps, is with his company at the camp in Peekskill, N. Y.

Harold P. Maloney has returned to the service and is now connected with the office of City Manager McDermott.

City Manager McDermott is spending his vacation at Stroudsburg, Pa.

Managers Appointed

Wm. Reiss, East Liverpool, Ohio; Geo. A. Gray, Idaho Falls, Idaho; Evelyn Cornforth, Far- , N. D.; F. H. Miller, Elmira, N. Y., and Mary Lauchlin, Wagram, N. C.

Pittsburgh

W. D. Vincent has been appointd night wire chief, vice H. J. Colebrook, resigned. C. J. Hyde succeeds Mr. Vincent as night quad chief.

Operator G. K. Biber has been promoted to the position of assistant quad chief, vice J. Frewen, resigned.

Mrs. E. Y. Ouderkirk is on a two months' leave of absence.

Operator L. F. Caldwell has been assigned to the all night force, vice Max Levine, resigned to enter the automobile business.

New Arrivals

R. Palmer, C. F. Gallagher, C. V. Baker, Max Braurman, and Dave Susman.

One of our correspondents writes: "News scarce. Everybody is hanging on to his job. No one has resigned and no one expects to resign. Many wish to be appointed, but there are no vacancies. There have been no promotions and there will be none until the weather gets cooler. News worthy of publication is very scarce in these diggings. The whole situation is summed up as no news is good news."

In Danville, Va., the managers of the Western Union and the Postal Telegraph Cable companies were arrested for violating the Child Labor Law of the State at the instance of one of the societies, which has for its object the enforcement of this law which never should have been passed by the legislature. The difficulty of obtaining messengers was explained to the mayor, and he discharged both managers when they promised not to violate the law again.

Radio Control Over Ships a Success

The efficient performance of the battleship *Iowa* under radio control during recent aerial bombing tests may lead to revolutionary changes in naval development, officers believe. Without a soul on board, the *Iowa* was manoeuvred from the battleship *Ohio,* five miles away, with the utmost precision, and there was not a hitch in the mechanism in more than two hours while the *Iowa* was being bombed.

It was a scientific triumph. The *Iowa* was a real "Flying Dutchman," that mythical crewless ghost of the seas, as she obeyed the will of Captain F. L. Chadwick on the *Ohio,* almost hull down on the horizon. The invisible, magic fingers of the radio reached out across the sea to whirl the *Iowa's* steering wheel, operate the fuel oil and water supply valves and start and stop the ship.

So perfectly did the control function that the officer on the *Ohio* manoeuvred the *Iowa* away from the attacking air forces at the moment the bombs were being released, varying the speed of the target vessel at will.

Army and navy officers who witnessed the test were much impressed by the possibilities of development of the radio control idea for use in future wars.

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Western Union Telegraph Co.

THE following changes in organization will become effective July 16, 1921:

The engineering and research work of the company will be consolidated in charge of G. M. Yorke, vice-president. The construction and repair of the ocean cable system will remain in charge of Mr Yorke.

W. C. Titley is appointed General Superintendent of Plant (Land Line System) with headquarters in New York, reporting to the president.

H. E. Biggle is appointed Division Plant Superintendent, Mountain Division, Denver, Colo., vice Mr. Titley.

COLONEL I. D. Hough, assistant division traffic superintendent, Eastern Division, has been appointed division traffic superintendent of the newly-created Metropolitan Division, with headquarters at 24 Walker Street, New York.

FRANK KITTON, assistant plant engineer in the office of Vice-President G. M. Yorke, New York, is spending the month of July at Branford, Conn.

W. E. BELLMAN, general inspector, has returned to his office, New York, after a trip in the South and Southwest, which kept him out of the city for two months.

New York Western Union

J. A. WALSH has returned from vacation at Centerburg, Ohio, spent on his uncle's stock farm.

HARRY BEHNKEN has also returned from Long Island.

THE biggest surprise of the season to date was sprung July 5, when Miss Pearl McCann returned from vacation and announced that henceforth she would be Mrs. Jack Kilgariff. The congratulations and best wishes of the Commercial News Department were presented.

JULY 5th was quite an auspicious date for A. V. Waldron, of the Commercial News Department, as on that date Mr. Waldron completed his fifty-second consecutive year of service in the employ of the Western Union organization.

MISS Elizabeth Larsen, senior operator on the Los Angeles Circuit, was married on July 14th.

MISSES Dora and Minnie Laufer are spending their vacation at Atlantic City.

THE Automatic Local, No. 92, Automatic Operators, have chartered a steamboat for Sunday, August 7th, and will have a trip to Bear Mountain on the Hudson.

AN official from one of the outside divisions called at the executive offices recently and asked to see someone who was absent on vacation. He named another official who was also away from his office. He asked for several others in succession, but none of them were west of the seashore. As a last chance to see someone in authority, he called at the president's office, where he found Newcomb Carlton hard at work at his desk, with L. McKisick, assistant to the president, a good second. He thereupon felt that his trip to the metropolis had not been in vain.

SPRINGFIELD, Mass., enjoys a new main office fully equipped and up to date in every respect. It ranks next to the Boston office in size and equipment.

IN the Speed Race in handling traffic conducted by the company in the Southern Division, Charleston handled 100 per cent. of business in maximum of six minutes and 65 per cent. in three minutes, Montgomery second, Augusta third, Wilmington fourth, Birmingham fifth, Norfolk sixth. Charleston has forsaken the ten-minute maximum limit on business filed. Division Traffic Superintendent H. G. Heininger is proud of the showing.

Philadelphia

THE Electrical Aid Society for the six months ended June 30 last reports having paid $1,019 in sick benefits and $500 to cover death claims, while the sum of $150 was taken out of the Relief Fund for the care of special cases. Membership now in good standing, 1,060. The Society has just added ten shares of Building and Loan stock to its investments, making a total of forty-five shares to date. Executive Committee authorized the purchase of $1,000 United States Certificates of Indebtedness. The Electrical Aid Society was organized in 1888 under the title of Telegraphers' Aid Society of Philadelphia and changed to its present name in 1905, admitting employees of the Electrical Bureau. To date over $70,000 has been paid in sick benefits and about $15,000 in death claims.

JOHN W. BENCKERT, of the plant department, spent the week of July 4th at Atlantic City with his wife, the occasion being their 50th wedding anniversary. Mr. Benckert is still young and active at seventy-three.

Lake Division

ONE hundred and fifty Chicago messengers recently spent a very enjoyable Sunday at a picnic which was held in a Forest Reserve to the northwest of the city. The boys were transported to and from the grounds by trolley car. The day was spent in feasting and play and the demand for a repetition has been so general that another outing will soon be given.

JAMES B. RANKIN assumes the managership at the 123 West Jackson Boulevard office.

W. A. HOLUB, cashier and money transfer agent, Chicago, has commenced his vacation.

C. A. ANDERSON, aged forty-nine years, for twenty-one years identified with the Western Union Telegraph Company at Chicago, and for a long time chief operator of the Metropolitan Division, died at Reno, Nevada, on June 26th. Mr. Anderson went to Nevada several years ago for the benefit of his health. He was a native of Illinois.

NIGHT Messenger Joseph Menosky, a Chicago messenger, having a telegram to deliver and receiv-

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ing no response to his efforts in gaining an entrance to a house, peered through the window and saw a man laying on the floor in a pool of blood. His prompt reporting the matter to the neighbors and police, saved the man's life.

Two former employees of Ashland, Wis., Elmer Roethig, operator, and Edward Greenfield, clerk, have just returned from a tour to California. They left Ashland last September in their "flivver," and worked their way to San Diego, Cal., then up to Portland and back east. They report having had a very fine trip and no accidents.

A COMMERCIAL Development meeting was held in Youngstown, Ohio, on the afternoon and evening of June 10th, under the supervision of District Commercial Manager Bowen, several managers from nearby points being in attendance. The afternoon session was devoted to presentation of Selling Talk, in which several of the visiting managers took part, while the evening session, which was augmented by the commercial forces of the Youngstown office, was taken up in discussing various ways and means of developing new business. District Commercial Manager Scorah, who was present, gave a short talk on Bulletins, Routines and Errors, while Mr. Bowen's talk on Inside Salesmanship was extremely interesting, Local Manager Zimmerman closing the meeting with a plea for loyalty and co-operation. The meeting was thoroughly interesting from start to finish and cannot help being productive of much good.

Radio Corporation of America

TRAFFIC Manager W. A. Winterbottom of New York has completed his visits to Wales, Norway and France, and is now in Germany.

ON the occasion of the marriage of Henry Heisel, of the accounting department, he was presented by his office associates with a handsome dinner set, as a token of their good wishes for himself and his bride.

C. J. Ross, comptroller, has returned from a business trip to Ohio.

THE London and Paris radio circuit does an arbitrage business for the Stock Exchange people between the two cities with a maximum delay of fifteen minutes in the exchange of messages. The manager of the London office, G. E. Clarke, has had a wide experience in this sort of fast service, and he looks upon the present accomplishment as a matter of course.

International Radio Telegraph Company

E. D. FORBES, chief engineer, is at Belfast, Me., in connection with work progressing on the new high-power coastal station in course of erection there.

When the steamer *Munalbro,* KUX, was in distress off the New England coast at 8 a. m., July 5th, New London was the first coastal station to offer assistance. Although the SOS calls were not respected by a competition station on Long Island, Operator C. R. Underhill succeeded in clearing the distress messages through the interference.

C. V. HOLMES, auditor, has returned from a trip to Washington, where he was in conference with naval and department of commerce officials.

THE Brooklyn station, WCG, of the International Company, in charge of Chief Operator A. J. Costigan, has been fitted with two 2 Kw. and one 5 Kw. 500 cycle transmitters. Baseball scores are transmitted broadcast on 2400 meter wave at 8.30 p. m. each day. Signals are reported as the loudest of all the New York stations.

M. M. BUCHBINDER, maintenance engineer, is making some further improvements in the receivers and transmitters at the New London station WLC. Chief Operator A. Barbalate reports numerous cases of long distance from New London, despite summer fading and static conditions.

MONITORING tests and intensity measurements made day to day and hour to hour on trans-Atlantic signals received at the Rockland, Me., laboratory, are being continued and are giving further valuable data of the character described by S. M. Kintner, Vice-President in charge of Engineering and Research, at the recent Institute of Radio Engineers' meeting.

WILLIAM S. WEIBLE, superintendent of the telegraph department of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., has been in the employ of that company for thirty-three years. He was born in Allegheny County, Pa., in 1864, and began his telegraph career as a messenger for the Western Union Telegraph Company at Pittsburgh, soon graduating as a telegrapher, which position he held for a few years until his transfer to the Westinghouse interests. Mr. Weible has a large circle of acquaintances, all of whom have nothing but praise for him for his sterling qualities. He is regarded by the Westinghouse people as one of the most trustworthy officials in the service of this great corporation.

All America Cables

THIS company announces the opening of their new office at Santiago-de-Cuba, the rate being fifteen cents per word. To other points in Cuba twenty cents per word. Deferred rate Santiago-de-Cuba, four cents per word. All other points in Cuba eight cents per word. This new route also establishes a direct route to Porto Rico, Jamaica, St. Thomas, St. Croix, Guadeloupe and British West Indies stations.

A REDUCTION of eleven cents a word in the rate from New York to Brazil is announced. The new rate of fifty-four cents a word, a cut from sixty-five cents, applies to messages for both the company's stations at Rio de Janeiro and Santos.

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Back to the Right Road

The heaviest handicap to readjustment is our unwillingness to readjust, not in the sense that a few of us are unwilling and are obstructing the way, but in the sense that none of us is willing to carry through the readjustment that is needed. Most of us think of readjustment as the process of turning from the employments of war to the employments of peace, or as getting back to normal. We might as well think of going back to the Dark Ages. What the world needs and what it is trying to get is readjustment to peace conditions from outworn peace conditions and not from war conditions. The war itself resulted from our efforts to readjust the peace conditions that existed at the time of its outbreak. The industrial age had gotten to the point at which it was impossible for it to go on under conditions and restrictions which made it step on its feet at every other step. If we go back to normal we shall go back to the conditions from which the war arose, and to more wars. It is well, therefore, that we are not finding readjustment to normal easy. We are not finding it easy because subconsciously we know that we do not want to go back to normal, that we do not want to go back at all, that we want to go ahead. The delay is affording us time in which to think, time in which to lay the foundations for a real and lasting readjustment to new peace conditions. Before-the-war conditions tended to send us all out on the same limb, we were all ambitious to be cobblers, to live by selling shoes to the others. It was inevitable that we should make too many shoes. A world in which the inhabitants lived by taking in one another's washing would be far more ideal, for it would at least be a world in which there would be co-operation. We are finding readjustment difficult because we all want to go back to our old jobs, back to cobbling. That is true of us as nations and it is true of us as individuals; the individual who is a plumber will not work at being a gardener, the nation which well earned its living in the factory will not turn to the field. And that is reasonable and natural, man's nature is the product of habit, he is predisposed to do the old things, to live as he has lived. But the world moves. Glaciers slip down from the North and smiling valleys become fields of ice. Men move on before the tides of ice and men move on before the tides of other men. Necessity truly knows no law, habit falls away and man reverts to the elemental, adapts himself to the conditions forced upon him. Arguments do not win men to do what they ought to do in their own interest, especially if that interest is remote. We do the thing at hand, the immediate thing, and even though we can see through a stone wall we are not willing to break through it unless we are sure of what we are going to get for doing so. We see the necessity for a complete readjustment, but we will not go through with it unless we are forced to do so. That is not the fault of the system of economy under which we live, nor is it because of a lack of bold leadership. The thing is a thing of time, of slow and cautious readjustment. We know that readjustment is inevitable, that we can not all go on making shoes, and that is the important thing. We can at least stop doing the things that are inconsistent to the readjustment that is to come. We know, also, that economic error cannot be corrected by war, that we cannot force ourselves forward over roads which bear "No Thoroughfare" legends every hundred yards. The fate of Germany presents a lesson which no country will soon forget.—*American Exchange National Bank of New York.*

Creosoted Poles

The Forest Products Laboratory has been collecting records recently on the effect of light creosote oils in wood. The report states that 1,558 telegraph poles in the Montgomery-New Orleans line which were pressure-treated with a light creosote oil, 1,049 poles were still sound after sixteen years. In 91 per cent. of the cases of decay the fungi had entered the wood through checks and shakes. Representative sections in the Norfolk-Washington line showed that after seventeen years' service, of the 1614 poles inspected, 1469 were sound, 92 decayed at the top, and 105 decayed at the ground line. The decay at the top was caused chiefly by cutting off the poles. In those decayed at the ground line, the causes of failure, as determined in 88 per cent. of the cases, were checks or shakes. The preservative outlasted the mechanical life of the wood.

Unless some other factor than protection from decay is considered important, therefore, there is apparently no need to specify high boiling oils. The important point is that any coal tar creosote which is not extremely low boiling or extremely high boiling will satisfactorily prevent decay, and in the selection of an oil, factors such as price, penetrability and convenience in handling should receive greater consideration than moderate differences in volatility.

Kite Balloons Destroy Telegraph Property

Two kite balloons in tow of battleships enroute from Santa Barbara to Monterey Bay, Cal., parted their cable on June 27th and both drifted inland to Santa Barbara County, raking to the ground many telegraph, telephone and railroad telegraph lines. Naval kite balloons breaking away from battleships are somewhat new and will be added to the causes of destruction of telegraph property as have recently been added airplanes causing damage to telegraph lines at times, as well as snakes and box car roofs.

A WIRELESS telegraph receiving station, fitted with apparatus capable of receiving messages over a distance of 12,500 miles, has been erected at the Observatory at Perth, Western Australia. The number of radio stations operated and controlled in the Commonwealth was stated by the Minister of Defense recently to be twenty, exclusive of three naval stations.

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The Application of Radio to Navigation Problems

One of the first applications of radiotelegraphy as an aid to navigation, aside from the simple transmission of radio messages to and from ships relating to matters of distress, to which it is unnecessary to refer, and one of the simplest applications, was the sending out of the so-called time signals at stated intervals, said Rear Admiral W. H. G. Bullard in a recent address, reprinted in part from the *Journal of the Franklin Institute*. Time is an important element in navigation, and one of the two co-ordinates which fixes the position of a ship at sea, namely, longitude, is determined entirely from the element of time. Difference of longitude is only a question of difference of time, and the actual longitude measured from a given meridian is the difference between the times measured from that meridian and the local time. The time carried by mariners is obtained from a delicate chronometer, which is regulated to Greenwich Mean Time, and which, if absolutely correct, registers the correct mean time, counting the meridian of Greenwich, England, as the zero point. Knowing this time and the local time, the determination of the longitude resolves itself into a question of arithmetic, and the difference of time, and hence the longitude, is at once known. Ship chronometers, however, are subject to errors and rates, and these errors and rates must be determined to apply to the clock face time in order to obtain the correct Greenwich Mean Time. The finding of the local time is a question of observing a heavenly body's altitude, and applying appropriate formulae. Thus it is seen how important it is to know the correct Greenwich Mean Time, as the local time is easily obtained by observation.

Correct 75th meridian time is kept at the United States Naval Observatory, and it becomes the problem of carrying this time to ships at sea, so the errors of the mariners' chronometers on 75th meridian time and hence on Greenwich or zero mean time may be known. This error applied to the clock time gives the correct Greenwich Mean Time. This correct 75th meridian time is sent from the Naval Observatory by means of radio signals. Five minutes before each noon local 75th meridian time, a telegraph circuit is associated with the pendulum of the master clock at the Observatory, and a relay at the Arlington radio station. Once each second the electric circuit is momentarily closed by the circuit maker of the clock's pendulum and the relay at the radio station is energized. This closes a switch which permits a radio dot to be broadcasted into the ether. All ships having radio receiving sets tuned to receive Arlington's wave, receive this signal as a dot in the telephone receivers. Signals are started out five minutes preceding noon 75th meridian time, and a dot is sent once each second, with a break in the dots on the 29th second and the last five seconds of each of the first four minutes, and finally the last ten seconds of the last minute. The time of exact noon, or the instant of 75th local noon, is a little longer contact after the ten-second break. The mariner marks the time shown by his chronometer and hence knows at once his error. It is advisable to check the time this way every day, but if this is impossible it should be taken after a lapse of several days, and with the two errors and the elapsed time the rate is known, which, applied to the error in one day, will give the error for any succeeding day. Time signals are sent out broadcast by the following stations on the Atlantic, Pacific and Gulf coasts in the United States:

Washington.—Daily at 11.55 a. m. to noon and 9.55 to 10 p. m., standard time, 75th meridian.

Key West.—Same as Washington.

New Orleans.—Daily at 11.55 to noon, standard time, 75th meridian time.

Darien, C. Z.—Daily at 12.55 p. m. to 1 p. m., 75th meridian standard time.

North Head, Wash.—Daily, except Sundays and holidays, at 11.55 a. m. to noon, 120th standard meridian time.

Eureka, Cal.—Same as North Head.

Point Arguello, Cal.—Same as North Head.

San Diego, Cal.—Same as North Head.

San Francisco, Cal.—Daily at 11.55 a. m. to noon and 9.55 to 10 p. m., 120th meridian standard time.

Great Lakes, Ill.—Daily at 10.55 a. m. to 11 a. m., 90th meridian standard time.

Time signals sent out from Washington, Key West and New Orleans, are from the Naval Observatory at Washington; those from the Pacific coast stations from the Naval Observatory at Mare Island, Cal. Signals from Darien, in the Canal Zone, are sent out from a master clock there, which is regulated each day by the signals sent out from Key West, and is thus sent one hour later. This is for the benefit of shipping in the vicinity of the Canal Zone that cannot receive Key West.

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"Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, offers the most complete study of the telegraph ever published. This standard text-book has been revised and brought up to date, and in addition to numerous diagrams and complete information covering the study of the telegraph, includes full descriptions of the newest apparatus adopted by the Western Union and Postal Telegraph companies, and the equipment of a modern telegraph office. This valuable book, with its 488 pages, 250 illustrations, and carrying an appendix of 24 pages and 16 illustrations covering the new Western Union Multiplex System, is the most sought after electrical book on the market. $2.50 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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CONTENTS

Mechanics of the Solenoid Master Switch. By Harry E. Hershey. (Continued from page 315, July 16th Issue) 338
What the Associated Press Is and Does. The Art of Life..... 340
Epitome of Progress in Electrical Science in Europe..... 341
The Western Union Telegraph Company's Earnings Report..... 342
Old Time Telegraph Reminiscences. By Robert F. Easson, Toronto. (Continued from page 322, July 16th Issue)..... 343
American Telephone and Telegraph Company's Earnings Report..... 344
Canada a Wonderland. By J. Frank Howell 345
Telephone Pioneers of America. The Pulpit and the Electrical Industry. International Communications Conference 346
Student's Course in Technical Telegraphy. By Louis Casper. Lesson 32 347
Ship Bearings by Radio. Ownership of the New York Telephone Company 348
Old Time Telegraphers' and Historical Association. Radio to Report Future Events 349
Editorial—The Cost of Publishing as High in England as in the United States. Full Opera Sent by Radio. Optimism, Not Pessimism.... 350
The Railroad—Telegraph and Telephone Section of the American Railway Association. International Association of Municipal Electricians. The Ghegan Simplex Main Line Relay 353
No German Cables Yet. Western Union Loses in Court. Heroes' Memory Honored by Great Industrial Athletic Field..... 354
All America Cables. Radio Corporation of America. Obituary..... 355
Personal. Postal Telegraph-Cable Company. Cable Now to Antwerp.. 356
Western Union Telegraph Company 357
William C. Titley. Harry E. Biggle 358
International Radio Telegraph Company. Wireless Telephony. Western Union Men Win 359
Important Additions to Phillips' Code. Vacuum Tubes a Live Subject. Books, Hobby of Mr. Vail 360

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Mechanics of the Solenoid Master Switch

By Harry E. Hershey

Of the Automatic Electric Company, Chicago

(*Continued from Page* 315, *July* 16*th Issue*)

The solenoid master switch is a recent design, and differs from the older types in that it feeds only one way, that is, when seeking trunks this master switch moves from right to left, but when moving from left to right the motion is a continuous one under the control of a solenoid. In Fig. 19 will be seen the locking segment L, which carries the shaft S, by which the alignment of the idle line switches is controlled. This shaft is moved from right to left under the influence of a spring as shown, and from left to right by means of the solenoid SL. One arm of the locking segment L is so formed as to force the springs Y into engagement when the master switch is standing opposite the first trunk. The trip relay T has a mechanical lockup feature, which, after it is once energized, will hold the springs in an operated position until mechanically released. A second arm of the locking segment is so formed as to release the springs of the trip relay T when the master switch comes opposite the tenth trunk.

The master switch bank consists of ten sets of double contacts, the lower contacts being multiplied together. Each contact in the upper row is associated with one of the line switch trunks. The master switch wiper is so constructed that it will short the upper and lower bank contact associated with the trunk upon which it happens to be standing. The locking magnet LM is so constructed that upon energizing it not only forces its springs together, but also draws the retaining arm RA out of engagement with the locking plate L. Furthermore, if the retaining arm is resting against the locking plate L, but has not yet fallen into a slot, the retaining arm will hold the springs of relay LM in engagement. The trip relay is 500 ohms in resistance and the locking magnet 70 ohms. The solenoid is between 50 and 80 ohms, and the busy relay O and relay X, 1,000 ohms each. Both windings of the starting relay SR are 1,300 ohms in resistance.

Circuit Reading of the Solenoid Master Switch

We will assume that the master switch is standing opposite trunk number eight, and that a line switch plunges in on this trunk. As explained in the previous issue the release trunk ground from the connector will be extended to the master switch bank contact associated with this trunk. A circuit can now be traced from release trunk ground, through master switch wiper and starting relay SR to negative battery. Relay SR will energize and close a circuit from ground through springs of relay SR, locking magnet LM to negative battery. The locking magnet will energize and withdraw the retaining arm from the locking plate.

The locking plate, now being free to move under the influence of the spring, will cause the master switch wiper and the idle line switches to swing in front of trunk number seven. If trunk number seven is idle there will be no ground on the associated bank contact, therefore relay SR will de-en-

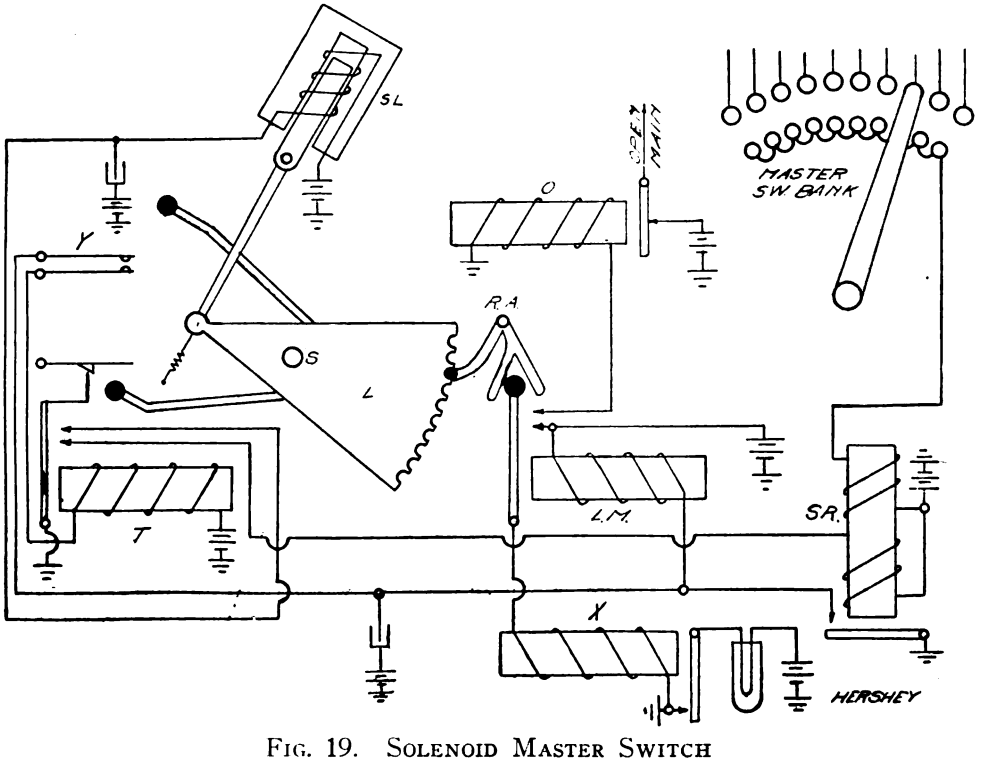

Fig. 19. Solenoid Master Switch

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ergize and open the circuit of the locking magnet The locking magnet will de-energize and allow the retaining arm to drop into the seventh slot in the locking plate. This will arrest the movement of the locking plate and will hold the master switch wiper and the idle line switches opposite the seventh trunk until such time as that trunk becomes busy. If the seventh trunk had been busy the circuit of relay SR would not have been opened, and the rotation would have continued until such time as an idle trunk was found.

windings of the line switches. Therefore, a line switch cannot plunge in while the master switch is moving, for at this time the open main circuit is open at the springs of relay O. The springs of the locking magnet, when in an operated position, also close a circuit through the supervisory relay X. This is to insure that a master switch cannot "get stuck" without giving an alarm.

Clearing the Called Line of Attachments

In the Automatic System as it now stands, each

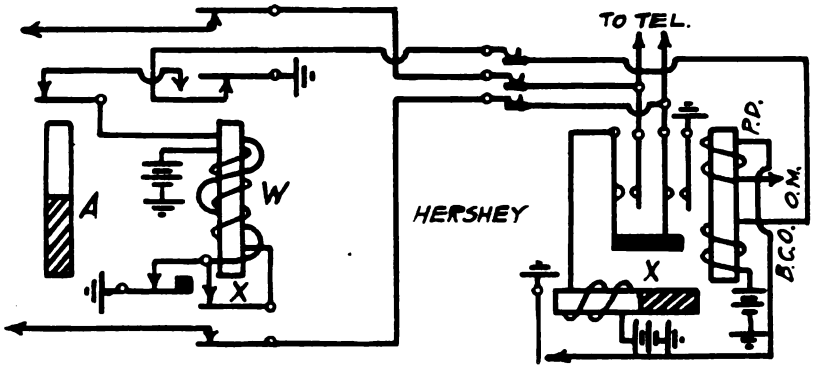

Fig. 20. Clearing Called Line

For our next discussion let us assume that the master switch is standing opposite trunk number one. When a line switch plunges in the circuit of relay SR will be closed as before. Relay SR, upon energizing, will close the same circuit through locking magnet LM; and a new circuit will be closed from ground, through springs of relay SR, springs Y and trip relay T, to negative battery. Trip relay T will energize and mechanically lock itself up, at the same time a circuit will be closed through the solenoid SL and a holding circuit will be provided through the second winding of the starting relay SR. The solenoid will now operate to move the master switch wiper and idle line switches opposite trunk number ten. When trunk ten has been reached one of the arms on the locking segment will release the springs of the trip relay T. The circuit of the solenoid and the holding winding of relay SR will thus be opened.

If trunk number ten is idle relay SR will de-energize and open the circuit of the locking magnet LM. The magnet LM will de-energize and allow the locking arm to enter the tenth slot in the locking segment. If the tenth trunk had been busy, relay SR would have remained energized on account of the ground from the master switch bank contact, and the master switch would have moved to the left in its search for an idle trunk. It will be seen that so long as the springs of the locking magnet LM are in an operated position the circuit of the open main relay O will be closed. The open main relay carries a pair of break springs through which "open main" battery is fed to the group of line switches. As you will recall, the open main conductor is connected to one side of the pull down line terminates on a line switch. When the line switch is at normal one side of the line is connected to the line relay, and the other side of the line goes to ground direct. When a telephone is called it is necessary that the line be cleared from this battery and ground feed; this is what is termed "clearing the called line of attachments," and was listed as Function D in Chapter I.

In Fig. 20 is shown a portion of a connector switch circuit. It is assumed that a certain number was called, the line was found to be idle and relay W cut the connector through to the wipers. At the right of the figure is shown a part of the line switch circuit associated with the called line. When relay A de-energized following the cessation of the rotary impulses, a circuit may be traced from "off normal spring ground," low winding of relay W, break springs relay A, break springs relay W, private wiper, through the B. C. O. of the called line switch to negative battery. The B. C. O. of the called line switch will operate over this circuit and clear the called line of attachment, the relay W will also operate sufficiently to close the springs X. When the springs X are closed a circuit may be traced from "off normal spring ground," make springs relay W, high winding of relay W to negative battery. The current flowing in this circuit will cause relay W to become fully operated. Direct ground now is placed on the private bank contact by the springs of relay W. This operation of relay W will be so slow that the B. C. O. of the called line switch will have sufficient time in which to clear the called line of attachments before relay W cuts the connector through to the wipers. The springs of relay W are of the "make before break"

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type, in order that the circuit of the B. C. O. will not be opened.

QUESTIONS

A. Why is it necessary to retain the locking magnet energized while the solenoid is swinging the master switch from trunk 1 to 10?
B. Should the starting relay have a weak or stiff spring tension?
C. If the locking circuit from the trip magnet springs went direct to the locking magnet, instead of to the second winding of relay SR, what difficulty would be encountered?
D. What trouble would develop if the Y springs failed to make?
E. What would be the result if the springs of the trip relay were not unlocked when the master switch reached the tenth trunk?
F. What would be the result should relay W cut the wipers through before the B. C. O. cleared the called line?

What the Associated Press Is and Does

"What sort of an organization," people frequently write this newspaper, says the *Kansas City Star,* "is The Associated Press? Can any newspaper buy its news service? Does it make a lot of money? Why isn't its stock quoted for sale on the New York Stock Exchange?"

This curiosity is natural. It is natural that most persons should have only vague information about an organization of this character. For it is not a commercial, money-making institution. It has no capital stock, and it pays no dividends. So it is not subject to the scrutiny of the investing public, and its reports are of interest only to its members.

The Associated Press is simply the agency through which several hundred newspapers co-operate to gather and exchange news. The *Star* and the *Journal,* for instance, gather the news in Kansas City and the adjacent territory through their own reporters. They want news by telegraph from the Chicago district. So, instead of sending reporters there they turn in to the Chicago Daily *News* and the *Tribune* and say: "Let's trade news. We will furnish you the Kansas City news, and you can send us the Chicago news. We will each stand our share of the expense of agents to look after the exchange, and of the telegraph tolls."

That is The Associated Press. The co-operative arrangement has been developed and elaborated, in the light of experience. In some of the larger cities staffs have been built up to facilitate the reporting of news and to supplement the work of the local newspapers. Thus, in Washington the co-operating newspapers maintain a large force of correspondents to serve them. Obviously, they would not be content to be supplied simply with the service of the Washington local newspapers. So, too, special correspondents are maintained in the chief news centers of Europe. The war was elaborately covered by The Associated Press.

The great bulk of the newspapers thus co-operating regard news as their chief stock in trade. They cannot afford to sell damaged goods. So they insist on the highest standards of reliability and impartiality in the handling of news by The Associated Press. In the course of years a highly efficient organization has been built up. Its reputation for accuracy extends to every part of the world. The line, "By The Associated Press," over a dispatch is the sterling label on news.

Being a purely co-operative organization, formed, as its certificate of incorporation says, "not to make a profit, nor to make or declare dividends, and not to engage in the business of selling intelligence," The Associated Press makes no money for its members. Last year its expenditures amounted to $5,000,000, and the members were assessed each week their share of this expense.

The outcome has been favorable to newspapers and the public alike. The co-operative arrangement has made possible a much more elaborate service than could have been built up in any other way. Because of this news gathering development the newspaper reader knows that every event of importance, no matter in what remote quarter of the world, will be presented to him interestingly and accurately, at the earliest possible moment and at a cost to him which is merely nominal. The Associated Press has become one of the great essential agencies of modern civilization.

The Art of Life

The whole art of life could be embraced in four propositions:

First: To find out what things you can do.

Second: To choose from among these what things in particular you should do.

Third: To resolve deliberately and unalterably to do this singly, and

Fourth: To do it unflinchingly and unceasingly.

His rules of life were also positive:

First: Cultivate self-sacrifice.

Second: Exercise a determined will.

Third: Preserve equanimity.

Fourth: Lead an active life.

Fifth: Be well known among your fellowmen.

Sixth: Look always beyond the present.

Seventh: Nourish an abiding faith in your own future.

Eighth: Aim at every object by direct means.

Ninth: Seek for knowledge always from the highest sources.—*World Wire Wireless.*

F. P. FOSTER of the Corning Glass Works, Corning, N. Y., in renewing his subscription, writes: "The AGE is about the only thing that now keeps me in touch with the activities which I used to be so much interested in. My work at present is not covered by the AGE, but it does cover many of the old friends which I remember with so much regard."

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Epitome of Progress in Electrical Science in Europe

(From Data Collected by Basil F. Howard, Electrical Engineer, Denver)

In the year 1873 Maxwell's treatise on electricity was given to the public. In this, electrical phenomena as ascertained experimentally by Faraday and others who had worked on the subject, were put before the readers in the form of mechanical and dynamical science, depending for the effects on strain on dielectric material and inertia in the ether. Previously the effects had been looked upon as instantaneous, but now they were shown to be progressive with time—that is, as wave motion.

This laid the foundation for modern electrical theory. At that time there was no knowledge as to what actually constituted an electric current, but the work of investigating electrical discharges in extremely rarified gases by Spottiswoode, De la Rue, Gordon and Crookes, followed by the work of Leonard in 1893 and Rontgen in 1895, brought the discovery in 1896 of the electron and the part it plays in connection with electric currents.

Experimentally, following up the work which Maxwell had commenced, the results predicted by many workers received full proofs and the work of Hertz between 1885 and 1887 opened up the possibility of wireless communication, and now our present knowledge with regard to the electron is highly complete, and, while the structure of the atom is at least partly understood, it remains yet to ascertain what the structure of the electron itself is.

When radium and its properties were given to the world in 1898 and it was shown that the atoms of chemistry were by no means eternal but subject to change, a revolution in knowledge was created.

In 1867 Werner Siemens and Charles Wheatstone simultaneously gave to the world the discoveries of the shunt and series self-exciting direct-current dynamos. Precursors of these were the generators, first with permanent magnets and afterwards with electro-magnets, either excited by a machine generating by means of permanent magnets or by electromagnets.

In 1870 Gramme's closed coil armature, or better known as "the Gramme ring," was given to the scientific world, and this gave a fresh impetus to the production of electric currents by mechanical means.

In 1873 the Drum armature was introduced, which gave a more efficient result, and in 1885, when Hopkinson gave a solution of the determination of the magnetic flux in a dynamo circuit, the dynamo became developed into a highly efficient machine, returning in the form of electrical energy about 98 per cent. of that mechanically supplied to the dynamo (in laboratory tests). Up to this time the armature windings of dynamos were laid over iron cores which were made usually of soft iron wire wound into a smooth ring or drum and copper brushes were universally used for collecting from the commutators. Largely for mechanical reasons, these gave way to a tooth form or slotted armature, between the teeth of which the windings were laid. These were the forerunners of the present-day direct current generators which have been evolved, namely, the multipolar type with commutating poles and fitted with carbon brushes.

The transformer was an epoch-making invention, by Gaulard and Gibbs, and was first shown in London, England, in 1883, and the possibility was at once recognized of the distribution of electrical energy at high pressure, but to be used at a low pressure. This gave a great impetus in the direction of alternating-current generators, and led to the adoption of the alternating-current system of transmission and distribution of electrical energy.

It is true that prior to this the Jablochkoff (Yablakoff) candle, a Russian invention, had been in use with which an alternating current was necessary, but this was because it was obligatory for the carbon pencils of the candle to burn evenly on the two sides, which would not have been the case had a direct current been utilized for lighting this arc candle.

It was in 1883 that Dr. J. Hopkinson showed mathematically that it was possible for alternating generators to run in parallel, and this was experimentally proved by Prof. G. Adams in 1884 with the generators at the South Foreland lighthouse.

The year 1886 marks the introduction by Tesla of the two-phase alternating-current motor system, followed in 1890 by that of three-phase. Eighteen ninety-one saw the transmission of power over 100 kilometers from the Lauffen Falls on the Rhine to Frankfort. This was carried out by three-phase alternating generators.

Doubtless the exhibition in Paris of 1881, followed the next year by that held at the Crystal Palace near London, did much to popularize and advertise electrical phenomena and to augment the rapid growth of development.

One of the earliest transmission lines which was operated by really high tension, as considered by today's standards, was that of Ferranti in 1890. This operated at 10,000 volts and transmission was accomplished through a paper-insulated concentric tubular conductor. This transmission line was about twenty-five miles long. Those of us who remember the introduction of this system will recall the trouble experienced in connection with the capacity of the conductor.

The progress since made regarding electric light and transmission of power is so well known that it need not be further dealt with.

With regard to telegraphy: Up to 1853 land telegraphy operated largely by single-needle instruments and in cases of more exacting service by Morse ink writing machines and sometimes Wheatstone automatic machines manipulated by means of perforated ribbons were in daily use. In 1853 the principle of duplex operation, or that of sending

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two messages in opposite directions at the same time on one wire, came to the front, and 1877 saw the sending of two messages in the same direction at the same time and two in the opposite direction at the same time, thus forming a quadruplex system. Since that time developments have been rapid in connection with the mechanical means of writing and sending messages and for providing a circuit efficiency of almost 100 per cent. with all the circuits employed, thus obviating time circuit loss or idle plant.

With regard to submarine telegraphy: The Atlantic cable had been successfully laid in 1865. In 1871 the siphon recorder and mirror galvanometer were in use as reading instruments and provided a speed of about fifteen words per minute. Improvements in methods by means of inductive shunts and sensitive apparatus brought the speed up to about sixty words per minute, and the Thermionic amplifying valve is enabling a further increase to be secured, together with a printing process at the receiving end.

With regard to electric telephony: This had not been successful until Dr. Bell invented his telephone and the year 1876 brought it before the attention of the public. The development of this is so well known that to enter into details is not necessary. The first practical "loading" of the line took place about 1902 and was accomplished by placing inductances at regular intervals on a line. This was preceded in the year 1891 by the introduction of underground cables for telephonic purposes which had paper insulation, and so reduced the capacity considerably below those insulated with materials such as gutta-percha and rubber compositions which had previously been employed.

With regard to "loading" telephone transmission lines it may be here mentioned that experiments were carried out in 1906 at Lake Constance in Switzerland by surrounding the wire of the conductor with an iron covering, and thus continuous loading without lumped inductance was provided. Also in 1911 a similar principle was applied to the channel cable connecting France with England, and in 1913 that which connected Vancouver and Victoria.

With regard to signalling through space without wires: In 1871 the idea had been in many inventors' minds that this was possible, and experiments were tried by transmitting currents through the earth or water between ground plates separated by a considerable distance. The receiving instruments were to pick up the signals by ground plates superimposed in the path of these currents. Little success, however, was secured until after 1876, when the telephone was used as a receiving instrument for such purposes. It was not until 1887 to 1889, when Hertz published his investigations with regard to Maxwell's electromagnet theory of light and radiation, that a clear path was shown to exist for a practical means of wireless communication.

In 1896 Marconi introduced the vertical grounded antenna and produced a workable system. It was Dr. Oliver Lodge who had also been working along the lines of wireless communication who pointed out the advisability of tuning the sending and receiving apparatus. Nineteen hundred and thirteen saw the discovery of Dr. J. A. Fleming that the current would pass in one direction only between an incandescent filament and an independent electrode present in a lamp bulb, showing that the apparatus was a rectifier besides being a very sensitive detector of small electric disturbance. The addition of a grid, which was placed between the hot cathode and cold anode and which could be connected to a separate circuit, the potential of which could be influenced by small external means, made it possible to produce large variations in the stream of electrons, and this led to the rapid advance in wireless telegraphy and later wireless telephony.

Looking back to the developments which have taken place in various branches of electrical science during approximately one-half of a century, and the enormous part which they have played in the advancement of civilization, it is strange to find that thankless mankind not only looks upon these wonderful privileges which have been provided as a matter of course, but DEMANDS them as his right and is unwilling to pay even a fair price for their use in service.—*Mountain States Monitor.*

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The Western Union Telegraph Company

Earnings report for six months ended June 30th, 1920 and 1921 (month of June, 1921, estimated), is as follows:

	1921	1920
Gross Revenues, including Dividends and Interest	$52,277,200	$59,963,428
Maintenance; Repairs and Reserved for Depreciation	$ 9,074,700	$ 8,290,763
Other Operating Expense, including Rent of Leased Lines and Taxes	38,469,075	43,939,126
Total Expenses	$47,543,775	$52,229,889
Balance	$ 4,733,425	$ 7,733,539
Deduct Interest on Bonded Debt	665,925	665,925
Net Income	$ 4,067,500	$ 7,067,614

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A Novel Suit

A suit has been brought against one of the telegraph companies for damages growing out of the failure to turn over to a sheriff in a Western city $500 bail money, which had been sent by telegraph and which for some reason or other had never been delivered. In the meantime the victim was kept in jail, and he believes he has a good case for damages.

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Old Time Telegraph Reminiscences

By Robert F. Easson, Toronto.*

(*Continued from page 322, July 16 issue*)

Operators of the present day can have but a faint idea of the trials and difficulties their congeners of sixty or seventy years ago had to contend with. As we had to do our own line repairing, I saw a great deal of the country on all sides of Chicago. Certain sections of the different lines ran across the prairies and others through the bush. In some instances, for nearly a quarter of a mile at a stretch, poles were dispensed with altogether, and growing trees, with an insulator nailed to them, used in their stead. In the open country the poles were slim and of the cheapest and commonest wood. In the summer time these line repairing excursions were not altogether unenjoyable, but in winter, when the thermometer hovered around zero and the vicious northwest winds were gamboling across the prairie, handling the wire and nippers, endeavoring to make the orthodox telegraph joint, was something to be dreaded. The office hours, too, were long, from eight in the morning until any old time at night. However, operators were not only willing, but glad, to stay around as long as there was anything to do. Extra pay for overtime was a thing unheard of. Even then there was something akin to infatuation in the business.

But time wore on, the telegraph began to share in the common prosperity, conditions were silently but surely changing. The service became more reliable and people woke up to the necessity of the telegraph for "government and commerce." Mr. Cornell's faith in its ultimate triumph never deserted him. He also had the courage of his convictions. Chauncey Depew, in an eulogistic address, said of him: "Upon his judgment he staked the accumulations of his life and the almost superhuman efforts of a decade." Every cent he could raise was invested in building telegraph lines, securing stock in lines already built, buying franchises and leasing lines, and in a few years from the time in which he was a cleaner of batteries in Chicago, we find him many times over a millionaire, so profitable had his telegraph investments become. With the unification in 1855-56 of the various telegraphic enterprises in the West under the title of "Western Union Telegraph Company," came Mr. Cornell's opportunity, and in the negotiations leading up to the formation of that gigantic organization Mr. Cornell, I believe, stipulated that it be called "Western Union."

Pardon me for referring at so great length to Mr. Cornell. He was a remarkable man and I consider it a great privilege, a great honor, to have known such a man. His son, Alonzo B. Cornell, was an operator in Montreal in the early days. As you all know, he subsequently became Governor of the State of New York.

I have dwelt so long on Cornell and my experience in the West that I fear I have exhausted the time allotted to me, as well perhaps as your patience. I returned to Toronto in 1855 at Mr. Dwight's solicitations. The Toronto office was still doing business at the old stand on Front Street. The staff consisted of six operators, Ben Toye being the oldest and best. In 1856 the company removed to the Corn Exchange Building, now occupied by the Imperial Bank, and about 1870 removed to its present location, which at that time was deemed altogether too large for its requirements, and the Dun Wiman Mercantile Agency occupied the largest portion of the second story. The Mercantile Agency went out of the building many years ago, and, as is well known, the Great North Western are badly in need of enlarged premises. On my return to Toronto I worked the heaviest circuits, and in 1859 was appointed operator and Associated Press agent at Father Point, Quebec. Before the advent of the Atlantic cable, Father Point was a most important news distributing center. On leaving Father Point, I returned to Toronto, and ere long was appointed chief operator. The Great North Western Company's news service having attained such proportions as to require the undivided attention of an overseer, I was in 1883 appointed Superintendent of Press and News Department. The company abolished its news service in 1910, and at that time I retired.

The early operator in Canada had rough and raw experiences, similar to those of his compatriots across the border, though perhaps of a less strenuous character. He was not only expected to work the line, but to know all about wires and batteries, fit up offices, and make himself generally useful. He didn't consider it "infra dig" to climb poles, dig holes, cut branches, replace pieces of line, or do anything for the good of the business.

In the early days the telegraph company deadheaded messages for theatres, circuses and shows of all kinds, stage coaches and even hotels. Operators found these "casual advantages" most helpful when troubled with an aching void in their pocketbooks. It is possible, too, that operators were happier when the entire electrical office machinery consisted of only a key, sounder and relay. Be that as it may, the old days and the meagre and simple outfit with which Morse and his early coadjutors puzzled and astonished an incredulous people, certainly form a striking contrast to these days of duplexes, quadruplexes, Morkrum printers, wireless and other fearfully and wonderfully constructed telegraphic apparatus.

Two or three separate telegraph companies were started in Canada at different times in opposition to the Montreal Telegraph Company, but these, after a brief and precarious existence, were absorbed by the latter company. The Dominion Telegraph Company, which opened up in Canada about 1870, was the first formidable opponent the Montreal company ever had. It was well managed, popular, and built up a large business. The telegraph situation became somewhat acute. A new company was formed, "The Great North Western," which leased the wires of both the Dominion and Montreal companies, paying to each a satisfactory yearly

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amount. The Western Union, being in friendly alliance with Great North Western, H. P. Dwight was the first general manager of the co-ordinated companies. Other recent telegraph changes have greatly increased the Great North Western territory and prestige.

The Canadian Pacific Telegraph Company came on the field in 1881, but did not enter into active competition for business until about 1886. The Canadian Pacific is still in the field, prosperous, vigilant, unafraid.

I copied for years the bulk of the press dispatches received at Toronto, both special and general. The speeches in Parliament, and at meetings throughout the country, while the question of Confederation of the Provinces was being thrashed out, and after the consummation of that measure, were very fully reported. These were the days of George Brown, John A. MacDonald, Cartier, Howe, Tupper and other leading political lights, and father of Confederation. *The Globe*, in particular, received very lengthy specials at this time, and I can safely say I copied almost the whole of them.

I was on duty and alone in the operating room on the night Lincoln was shot. The news created great excitement in newspaper offices, and presently I was besieged by newspaper men. Gordon Brown of the *Globe* hurried down to the office and waited until I got "30." I was on duty and alone on the night D'Arcy McGee was shot and killed at Ottawa. Mr. McGee was a prominent politician, member of Parliament, distinguished lecturer and poet, and occupied a large space in Canadian public life. Owing to the lateness of the hour at which the shooting took place only one Toronto newspaper had an account of the horrid affair the next day. In 1854, while in Chicago, I copied a fairly full synopsis of President Pierce's annual message. This was the first time a comprehensive abridgement of a President's message had ever been sent over the wires and was considered quite a feat at the time. I wrestled with it from about 9 p. m. until long past the "wee sma' 'oor ayont the twal." We got the report from Cleveland through a repeater at Detroit, and it came very badly. Fred H. Tubbs, a noted operator in those days, and for years superintendent of the Western Union Telegraph Company at Chicago, and who died in that city on October 14, 1919, sent the report.

As I was constantly in the hurly burly of the work, I handled, as you can easily imagine, many notable events during my long service.

On retiring in 1910 I had been in the telegraph service sixty-one years, fifty-six of which I spent in the Toronto office. I saw Mr. H. P. Dwight almost daily during the whole of that time, and except at the time when he "fired" me as a kid, I never had the least misunderstanding with him. Mr. Dwight was not only a telegrapher and able manager of telegraphs, but he was an alert observer of what was going on about him, a habit he retained to the end. He was one of the best men I ever met, kind, considerate, helpful. Isaac McMichael, who succeeded Mr. Dwight, in the general managership, was a telegrapher of outstanding ability. The fact that he was selected to succeed so able and popular a man as Mr. Dwight is proof of his calibre. He was master of his profession, from the ground up, and introduced many needed and valuable reforms during his all too short incumbency. As to the present general manager, George D. Perry, who has been untiring in his efforts to make the Toronto Reunion a success, knowing his innate modesty I hesitate to say all the complimentary things that could truthfully be said about him. He has a thorough grasp of the business in all its complicated phases. I doubt if either of his predecessors ever had so many perplexing and tantalizing matters to deal with as the changed business conditions are bringing about, but he is boss of the job. His training has fitted him for hard work and the solving of knotty questions.

There is an irresistible fascination about the telegraph business, but it is hard to tell just where the charm comes in. Those who retire from it to follow other pursuits retain a strong affection for it. Of course, it has its cares and worries and failures, but operators are always ready to acknowledge that "with all its faults they love it still," and never wholly forget, or want to forget, that they were once knights of the key. All this is quite proper. They ought to feel a pride to belong to a profession which has produced such men as we see here tonight. Men distinguished in practical telegraphy, men skilled in electrical science, men of diversified ability and prominent in the higher walks of life. Men of affairs, leaders in finance and commerce.

American Telephone and Telegraph Company's Earnings Report

The earnings report of the American Telephone and Telegraph Company for the first six months of 1921, says H. B. Thayer, president, to the stockholders of the company, shows a safe margin above dividends, not taking into account our interest in the undivided profits of the associated companies.

In spite of the slowing up of general business, the exchange and toll traffic of the Bell System is larger for the first half of this year than it was for the corresponding period of last year. The growth in subscribers' telephones has also been uninterrupted and a net gain of approximately 285,000 telephone stations has been made during the first six months of the year. This growth has been already financed and is now on a revenue producing basis.

With the service as a whole better than ever given previously in this country or elsewhere, there is a spirit in the entire organization which will not be satisfied until still higher standards have been reached.

SUBMARINE cable circuits that are worked with receiving condensers, it is said, effectually block out earth currents, such as heavy magnetic storms.

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Canada a Wonderland

Its Galaxy of Brilliant Talent

By J. Frank Howell

For a great many years, up to about the time of severing my connection with the telegraph, I had an ingrowing desire to connect myself up in some way with the Canadian Pacific Telegraph, but for some reason or other, this desire never materialized into form or substance, possibly because improvements in "coupling" were progressive. However, be that as it may, the germ was in my system and made itself known intermittently until it was thought best either to encourage its ruminating proclivities or else eradicate and extinguish the microbe altogether. So I faced the alternative and adopted the next best idea, that of making an OCEAN to OCEAN trip from Halifax, N. S., to Vancouver, B. C., over the Canadian Pacific Railway. This I did with probably greater exuberance of spirit than might be expected from one still in the enjoyment of youth.

The impressiveness of the wonderful scenery; its vastness, all impel me to say, over again, what I have said before, that the Canadian scenery makes one grand panorama and as such I would not presume to make a choice, for time, location, etc., is a concommitant of *each* spot or feature such as the repose and conservation of mature years might prefer as against the romantic dreams or other visionary extremes associated with youth. We might as well compare the intense gardening of the Dutch farmer with the North American rancher's slap-bang mode of agriculture.

In planning my trip, Billy Maguire, so well and popularly known throughout the profession, suggested that it would be like visiting a relative if I would call upon Robert Easson, in Toronto, and he would consider it as a favor to him. As Toronto was my last stop in Canada, I took advantage of the opportunity to do this, but instead of it being an act of charity toward friend Maguire, my meeting Mr. Easson was a veritable privilege, and one that I look back to with feelings of deep appreciation. Mr. Easson is Canada's grand old man and telegraph historian. When I visited his home I found him in the midst of his rose bushes and flower beds in the full enjoyment of his faculties. Probably his fondness for nature has a great deal to do with keeping him youthful at eighty-three. To paraphrase the popular saying, "Tell it to him in flowers," would make a very fitting bon mot in his case.

During my trip, which occupied about five weeks, it was my privilege to meet some very fine gentlemen of the dot and dash persuasion. My only regret is that I did not have more leisure time at my command to cultivate the acquaintances formed in this way, for I know that to me it would have meant many delightful hours. However, I appreciate the fact that I am the gainer by even the brief intercourse had with these gentlemen, all of whom are men of mark in their chosen vocation. I may be permitted space enough to mention a few of them:

In Halifax I met and had a pleasant visit with W. J. Brown of the Direct United States Cable; also A. H. Bannerman, of the Halifax and Bermuda Cable Company.

Just as I got through signing the hotel register at St. John, I was touched on the shoulder in an easy and graceful manner, suggestive of the true dime novel style, by G. M. Robertson, manager of the Western Union Telegraph Company, whose hearty salutation of greeting broadly included the city's welcome. He afterward accompanied me amidst the city's beauties and unfolded many stories of historical interest most entertainingly.

In our early days we were taught it was good manners to respect age and position, so with this in mind I must hasten to refer to ye olde timer, W. J. Camp, Commander of Dots and Dashes and graduate Knight of the Key—not that there are any external evidences that his age is in any sense the reason for high standing and importance in the community. It is due entirely to personal attributes which do him honor. Mr. Camp is assistant general manager of telegraphs at Montreal, where his endeavors to serve are ever on the alert. In his immediate locality he is ably assisted by Messrs. W. M. Thompson, superintendent, Montreal; W. D. Neil, superintendent, Toronto; with D. H. Barclay, agent at Quebec, and T. H. Holmes, agent at Ottawa, while at Winnipeg we find that honorable and venerable friend, William Marshall, assisted in his district by D. L. Howard, superintendent, Calgary; R. N. Young, superintendent, Vancouver; A. J. Clark, agent at Vancouver; E. W. Clayton, agent at Victoria. Surely a brilliant galaxy—worthy of the best that life can give.

Other acquaintances that I made on this tour were such as to make one proud of his social directory. At Winnipeg there was Nelson E. Noble, manager for the brokerage firm of MacDougall and Cowan. He will be favorably remembered by that wide circle sharing his acquaintanceship in New York, Montreal and Vancouver. E. D. Cotterell, once chief dispatcher for the New York Central in New York, is now one of the Canadian Pacific's wide-awake officials who falls in line as a Canadian Pacific "booster" as easily as if to the manner born. This would also apply to C. A. Cotterell, assistant general superintendent at Vancouver, whom some day I expect to see registered high in the directorate.

J. S. McDonald, inspector of Canadian Government Telegraphs at Edmonton, Alberta, when I called on him, was on the point of leaving for the Peace River Country, several hundred miles north, and suggested that I had better accompany him. But about this time it dawned upon me that I had already strayed a long, long way from the Bowery and I respectfully declined the invitation so nonchalantly extended.

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While in Vancouver, a pleasant visit and the exchange of a bit of reminiscence was had with J. T. Phelan, in charge of the Yukon Telegraph Company. Parenthetically, I may be permitted to say that some of these old-timers can relate stories of their "sunkissed" experiences with various animal natures of former days that put it "all over" those "good-night" parlor stories of Joe Barley, Bogardus, Skate Donahoe and others.

When at Ottawa the unique distinction was mine of hearing two ex-telegraphers—Messrs. Reed and Robinson—engaged in debate, one in the Senate and the other in the House, each of them being a minister of the Dominion. Mr. Camp accompanied me on this occasion and introduced me to Mr. Crane, another old-timer now in the Government employ, but about to be retired from active duty.

W. J. Duckworth, superintendent of plant, Canadian National Telegraphs, Toronto, by the way, does not show any evidences of the ravages of time in his appearance or cheerful disposition or power of conveying his limitless recollections of stirring and humorous events.

It was also a great privilege to meet George D. Perry, vice-president and general manager of the Canadian National Telegraphs, with headquarters at Toronto. A great deal has been printed about the sterling qualities of this official, and coming in personal touch with him at once proved that his worth had not been over-stated. The responsible trust reposed in him will be faithfully taken care of.

G. Paton, agent of the Canadian Pacific System at Toronto, was another gentleman who did his utmost to make my stay in this city one of interest and profit. All who enjoy the acquaintance of Mr. Paton will readily reach the conclusion that he succeeded.

I fear I have unduly encroached on your valuable space with this lengthy communication, but my excuse is, I am overflowing with recollections of all I saw and the friendly reception accorded me everywhere I went by the most hospitable people on earth and, therefore, I feel I must give some expression to my sentiments in that direction—even if inadequate to the occasion.

Telephone Pioneers of America

The eighth meeting and the tenth anniversary celebration of the Telephone Pioneers of America will be held at St. Louis, Mo., on Monday and Tuesday, October 24th and 25th. Information in connection with entertainment, hotels, railroad rates, special train, etc., will be furnished in detail later.

The presence of the members will make the event the greatest "Get Together" in the history of the Association.

R. H. Starrett, 195 Broadway, New York, is secretary of the Association, from whom additional information can be obtained when required.

The Pulpit and the Electrical Industry

It is not often that anyone is forced to make a selection between the Western Electric and the Church. Yet that is just the sort of a ticklish problem that faced Albert L. Salt forty years ago this month. Graduated from the public schools of Brooklyn, the famous City of Churches, young Salt was torn between a native desire to mount the pulpit and enter the new unfathomed field of electricity. Luckily for all of us, he succumbed to his more worldly inclination. One glance at the story of his forty years with the company—his romantic rise from an office boy's bench to a vice-presidency, convinces us that the church lost a great leader.—*Western Electric News.*

We wish to remind the Western Electric officials that Mr. Salt is not the only official who was called upon to decide between the church and the industrial organization. It is our recollection that E. N. Barton, for over thirty years president of the Western Electric Company, resigned his position when a telegraph operator for the Western Union Telegraph Company in the late sixties at Rochester, N. Y., to enter a theological seminary to study for the pulpit. Mr. Barton, while he was idle, met Professor Elisha Gray, who convinced Mr. Barton that it would be better for him to aid in the establishment of his electrical project than to devote his future to preaching the gospel. Professor Gray's arguments were convincing, and the result was that the electrical firm of Gray and Barton was established in Chicago and in New York. This concern prospered from the first and soon developed into the Western Electric Company. Mr. Salt is, therefore, only following in the footsteps of the man who so long headed this gigantic organization.

International Communications Conference

The International Communications Conference, which is now being held at Paris, as previously reported on page 302, July 1st issue, will continue its sessions for at least two months. There are many questions to settle at the Conference. The two principal are the internationalization of the Island of Yap as a cable landing place that the ten United States delegates have to settle to the satisfaction of their Government, as well as the disposition of the former German cables.

M. Paul Laffont, Under Secretary of State for Posts, Telegraphs and Telephones, presided at the preliminary meetings. The committee comprises representatives of the Governments of Great Britain, France, Italy, Japan and the United States, who have been called together by the French Government in order to carry out the decisions arrived at by the Communications Conference, which met at Washington at the end of last year.

LITTLE Bessie, aged five, after calling her mother several times during the night and receiving no reply, said: "Mother, are you really asleep or are you just p'tending you're a telephone girl?"

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY.

By Louis Casper

Lesson 32

In the preceding lessons it has been shown that the passage of an electric current through a conductor is accompanied by a magnetic field surrounding that conductor. If a telegraph line is in proximity to a line carrying a varying current, the corresponding magnetic field will surround and envelop the telegraph wire. This causes a difference of potential in different parts of the telegraph wire and consequently a current is set up therein which inevitably produces a more or less counter effect upon the regularly transmitted signals over such line. This, as already stated, is termed "electromagnetic induction," and is diagrammatically represented in Fig. 87, in which XY is a foreign wire

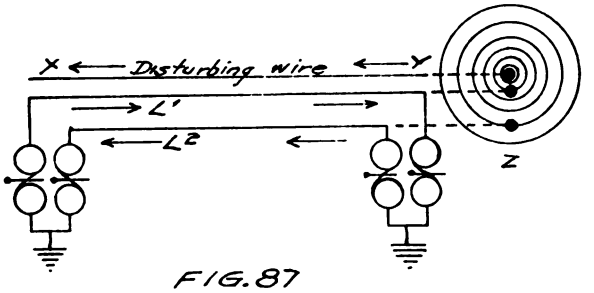

FIG. 87

carrying a varying current of electricity and L^1, L^2, two grounded telegraph circuits equipped with relays at each of their terminals. At Z a cross section is shown taken through the plane of the wires L^1, the concentric in circles around the wire XY representing the magnetic field. From this diagram it will be perceived that more lines of force of the field encircle the wire L^1 than enclose the wire L^2 and consequently there is a greater electromagnetic force induced in L^1 than in L^2. The result is to cause a current to flow in the direction of the arrows. Now, if by any means the wire XY can be moved and so placed with reference to the circuits L^1 and L^2 as to be exactly equi-distant from all points of both of the latter lines, and if, furthermore lines L^1 and L^2 measure exactly alike with respect to resistance, inductance and capacity, it is evident that as electromotive force is induced by the wire XY is equal in L^1 and L^2, no current will be produced in any part thereof, because equal opposite electromotive forces will be acting over all parts of a line having similar electrical properties. Such an ideal condition, however, can very rarely be secured and is given here merely as an illustration.

Another and more practical illustration is shown in Fig. 88, which shows the wires L^1 and L^2 forming a metallic circuit. This circuit is interchanged at the center of the same in such a manner that half the length of L^1 is placed nearest to the disturbing wire XY on one side of the center, and half the length of L^2 is nearest to the disturbing wire on the other side. It is evident from this diagram that the disturbing electromotive forces induced in L^1, L^2 will oppose each other, and if the latter metallic circuit will be reasonably well balanced, no current flow will take place. This method of entwining or twisting the sides of a metallic circuit in order to neutralize the effects of electromagnetic induction is called "Transposition."

It is easy to see in the case here illustrated that transpositions made at the center of each section of a well-balanced line affected by electromagnetic induction due to a contiguous wire carrying an alternating current of a moderate uniform volume is sufficient to nullify completely such electromagnetic induction. The freedom from earth disturbances on a metallic circuit is also apparent. It sometimes occurs, however, that both the lines forming a metallic circuit and the perturbing wire may suffer more or less from leakage, so that inducing and induced current are not constant over long stretches. This emphasizes the importance of a high insulation standard for metallic lines.

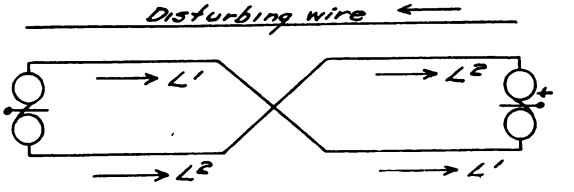

FIG. 88

Electrostatic Induction.—The disturbances caused in a telegraph line by electromagnetic induction are shown to be due to the presence of a varying magnetic field, for the lines of force of "cutting" the telegraph wire, set up in that circuit, a difference of potential which causes a current to flow through the telegraph line. Experiment shows that in some mysterious way the mere presence of electricity upon one body is capable of producing, or, as it is scientifically stated, *inducing* a charge of electricity of equal quantity, but of opposite polarity on other neighboring bodies. Consider Fig. 89, in which XY is a wire which carries current of some disturbing character, and AB, a telegraph line connected to ground at the terminals AB. CD are relays in circuit located as shown. If the wire XY becomes charged with electricity from any source, say positively, as indicated by the plus signs along the top of the wire, the presence of this charge will induce or create a similar equal negative charge in the telegraph line AB. So long as the electrical state of the wire XY does not change the negative charge in AB will remain quiescent, but if the electricity in XY passes away or is removed in any manner, the charge which has been accumulated in AB will pass to earth, and inasmuch as the electricity will travel along the lines of least resistance it is evident that half of the charge will pass to earth by A and the other half to earth by B, assum-

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ing that Z is the center point of the circuit and and that two halves, ZA and ZB, are equal in all electrical properties. If the wire XY is carrying an undulating current, it alternately becomes positive and negative, and consequently, negative and positive charges are induced in the wire AB, following the changes in XY with the same rapidity. As a result, there will be a series of moving charges in the two halves ZA and ZB of the line AB, and these moving charges will create a "kick" in the relays CD. But as half the charge on AB passes toward A and the other half toward B there will be no electricity traversing the point Z, and if a galvanometer or sensitive relay were placed at Z it would be seen that no electrical manifestation is apparent at that point; and further, if the line were cut at the point Z it would make no difference with the "kick" perceived in relays C and D, whereas if the "kick" were due to electromagnetic induction, the opening at Z would open the relays, and there would be no movement in the same.

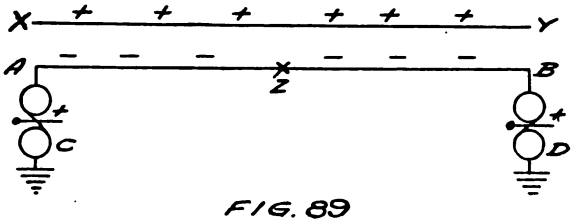

FIG. 89

J. J. Carty made investigations of this some years ago and proved this state of affairs in a telephone line, and he showed by many experiments that much of the noise to which telephone lines were subjected were due to electrostatic induction rather than to electromagnetic induction. Consider now what happens in a metallic circuit from the electrostatic standpoint. Referring to Fig. 90, in which XZ is the disturbing wire and AB a metallic telephone circuit. The presence of electricity along XY will induce an opposite change in the A

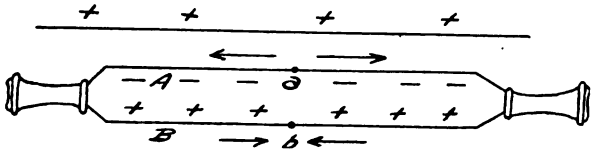

FIG. 90

side of the circuit AB and the charge on A will induce an opposite charge on B. As soon as the electrical state of the disturbing wire changes these charges will seek each other in an effort to neutralize and will flow along the lines of the least resistance. Evidently, half the charge upon A will flow toward the left-hand side, to meet the corresponding half of the charge on the left-hand side of B, and the charge on the right hand side of the center of A will flow toward the right in an effort to meet the half of the charge on the right-hand side of B, which will also move in the same direction.

These charges will, consequently, move in the direction of the arrows and produce currents in the telephone receivers at the ends of the line. If such a theory be true, cutting the line at the points marked a and b, no sound would be heard. This can easily be verified by experiment and can be proved true. To eliminate electromagnetic induction it is only necessary to transpose at the center sections of a metallic circuit, whether telegraph or telephone, so that the current flowing along one-half the wire should neutralize that flowing along the other half. Such a remedy, while it will mitigate electrostatic disturbance, will not substantially eliminate it unless the distance between terminals or repeater spans be short.

The next lesson will deal further on the effects of induction on telegraph circuits.

(*To be continued*)

Ships Bearings by Radio

Superintendent Putnam of the Lighthouse Service, New York, believes that fog, a terror of all seafaring men, soon will succumb to electrical science and ship disasters averted.

The system affords practical means by which navigators can take reasonably accurate bearings on fixed beacons which are not visible.

Mr. Putnam said the new radio system enables a mariner to find the location of his vessel in thickest weather, when lights and landmarks are not seen through the haze.

Ownership of the New York Telephone Co.

The New York Telephone Company is a corporation which owns and operates local telephone exchanges and local toll lines within the State of New York, and parts of New Jersey and Connecticut. Its capital stock, which pays dividends of 8 per cent. per annum, is entirely owned by the American Telephone and Telegraph Company; its bonds are owned by the public at large.

Be an Authority on the Telegraph

"Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, offers the most complete study of the telegraph ever published. This standard text-book has been revised and brought up to date, and in addition to numerous diagrams and complete information covering the study of the telegraph, includes full descriptions of the newest apparatus adopted by the Western Union and Postal Telegraph companies, and the equipment of a modern telegraph office. This valuable book, with its 488 pages, 250 illustrations, and carrying an appendix of 24 pages and 16 illustrations covering the new Western Union Multiplex System, is the most sought after electrical book on the market. $2.50 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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Old Time Telegraphers' and Historical Association

The committee on "Morse Sending," appointed at the Cleveland, Ohio, meeting in 1919 for the purpose of securing a record of the Morse of prominent Old Time Telegraphers, selected this year Colonel Robert C. Clowry, New York, as the sender, and Colonel Edward C. Newton, of Little Rock, Ark, as the receiver. The 1921 message was sent on Sunday, July 24th, from the office of T. W. Carroll, general manager, Eastern Division, Western Union Telegraph Company, New York, over a special circuit and was received without a break by Colonel Newton at the Capitol City Hotel, Little Rock.

The message was as follows:

New York, July 24th, 1921.

E. C. Newton,
Little Rock, Ark.

"It's a long time from 1861 to 1921, since we were both young fellows and worked the key, you under the "Bonnie Blue Flag with a single star," and I under the "Stars and Stripes." We both did our duty and were spared to see a gloriously united country. Some day the Great Commander will be calling us to another country, where many an old comrade will be in waiting to extend the familiar "73."

ROBERT C. CLOWRY.

The message in Morse has been recorded on an indestructible Edison phonograph disc which will be introduced at the coming Old Timers' Convention, to be held at Richmond, Va., October 18th, 19th and 20th.

It is worthy of note that notwithstanding Colonel Clowry is now in his eighty-third year, and probably has not handled a key in many years, his Morse was excellent. Colonel Newton is seventy-seven years old, and retired from the telegraph service in 1912. His reply to Colonel Clowry's message was as follows:

"The sentiment expressed in your message to the telegraph fraternity will be appreciated by all. After a great effort on my part to act as receiver of your message I am glad to greet you in old Morse over the wire once more, and sad to say, for the last time, as the curtain will soon be rung down on our parts in the drama of life—*Sic Transit Gloria Mundi* "73."

EDWARD C. NEWTON.

The committee on Morse sending is composed of Messrs. D. H. Bates, E. P. Griffith, L. B. Foley, Chas. Selden, C. P. Bruch and John B. Taltavall.

Those present in New York were Colonel Robert C. Clowry, Thomas E. Fleming, L. B. Foley, John B. Taltavall, H. E. Roberts, F. J. Scherrer and E. P. Griffith.

Those present at Little Rock were E. C. Newton, F. A. Mohr, B. P. Hancock, J. G. Hilbert, F. H. Austin, J. M. Delmar, D. C. Cason, E. W. Pittman and J. H. Frese.

Radio to Report Future Events

The success in reporting the recent Dempsey-Carpentier fight, which took place at Jersey City, N. J., on July 2nd, has spurred Radio Corporation engineers to let the apparatus remain intact for some time to come in order to permit extensive experiments designed to further popularize this novel news-reporting device. In fact, it is announced that if the proposed fight betwen Messrs. Carpentier and Brennan takes place on Labor Day, the details of the bout and its results will likewise be reported in the same modern manner.

In the future, it is proposed to employ the radiophone to report all events of national and international importance, such as elections and big sporting events. Indeed, we are living in the age of miracles and the day is not far when almost every home will be equipped with its own wireless telephone receiver, capable of receiving the news of the day on one wave length, and the latest popular music and songs on another, simply by turning a knob in much the same manner as we operate our victrolas. As a matter of record, many wireless amateurs throughout the country are doing this very thing now and it is only a matter of spreading the gospel of the radiophone to the every-day man.

The radio telephone is capable of very useful service. It has already proven its worth in many ways, notably reporting big events, sending sermons broadcast, music for dancing, reporting and directing fire fighting, conversing with airships in flight, and with the officers or passengers of vessels at sea, and finally reporting weather conditions and agricultural facts to farmers throughout the United States, a proposition which the United States Government is actively pursuing.

New Edition of Beginner's Manual of Submarine Cable Testing and Working, by G. M. Baines, Now Ready

Beginner's Manual of Submarine Cable Testing and Working, by G. M. Baines, has been thoroughly revised by its author and it was issued in fourth edition form on June 1st. The book is primarily for students in submarine telegraphy. All of the subjects on submarine telegraphy demanding attention have been brought within the scope of this volume, and have been dealt with, if not exhaustively at least at sufficient length to enable an intelligible idea to be obtained of them, which will admit of wider extension later. The book measures 5½ inches wide by 8½ inches long and contains 174 pages fully illustrated. The price of the work is $4.50 per copy, and it may be obtained at the office of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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EDITORIAL COMMENT

The Cost of Publishing as High in England as in the United States

In reply to a letter in the London *Times*, signed by a number of officers of learned societies and librarians, and protesting against the high price of scientific and other serious books, Geoffrey S. Williams, president of the Publishers' Association, points out that publishers are dependent on the printing, binding and paper-making trades, and cannot possibly issue books at lower prices until the charges made by these trades are materially reduced. The cost of printing, he states, is now about 2¾ times what it was in 1914; paper of an inferior quality costs more than double; binding, also inferior, costs over three times as much, and the total cost of a large edition of a small book works out at 180 per cent. above the 1914 figure. The maximum increase in the selling price, however, is 150 per cent. above the 1914 price, and it is generally much less. In the case of scientific books the cost of production has been trebled since 1914. The cost of materials has begun to fall, but wages, which are the dominant factor, remain at the highest point yet reached.

The above figures relative to publishing costs in England exactly fit conditions in the United States. There can be added to these exorbitant charges the cost of producing engravings in this country, which has been increased three hundred to five hundred per cent., which makes the use of engravings almost prohibitive.

Principle of the Open Door Reaffirmed

The United States does not admit that by virtue of the so-called Lansing-Ishii agreement Japan possesses any special interest in China incompatible with the unrestricted maintenance and plenary enforcement of the principle of the open door. Such is the significance of the note which has just been addressed by Secretary Hughes to the Chinese Minister at Washington with regard to the attitude of the State Department toward the controversy in which an American corporaion, known as the Federal Telegraph Company of San Francisco, has become involved.

The British, Japanese and Danish governments have objected that in contracting with this company for the erection of wireless stations in China the Chinese Government has disregarded and impugned certain monopolistic concessions which it had previously granted to the Marconi and other concerns, and they have insisted that the contract made with the American company be annulled. When this circumstance was reported some time ago to the Department of State at Washington the Chinese Government was notified that an abrogation of its contract with the American company would be regarded as an "unfriendly act," which in the language of diplomacy is an extremely strong expression.

It seems that since then Pekin must have been subjected to further pressure in the premises, for in a note recently transmitted to Secretary Hughes by the Chinese Minister at Washington the question was asked whether the Department of State had any idea of withdrawing its support from the Federal Telegraph Company. This inquiry elicited a vigorous negative. The Chinese Minister was informed that the United States was fully intending to maintain the position it has assumed, and the opinion was expressed that the erection of monopolistic communication agencies would naturally and inevitably result in slamming shut the open door which was described as "indispensable" to the "peaceful" development of commerce in the Pacific.

Full Opera Sent by Radio

Wireless telephones recently enabled people in Copenhagen, Vienna and other cities within a 600-mile radius of Berlin to hear "Madame Butterfly" almost as well as those siting in the State Opera at Berlin.

Reports from receiving stations within this radius state that this first attempt to send an entire opera by telephone was entirely successful, the orchestra as well as the voices of the singers being heard distinctly.

A number of experiments in wireless telephony have been made in Germany recently, but this is considered the most important. Microphones installed at the front of the stage and connected with the central government sending station made it possible.

One of the reactionary papers expresses regret that the first opera transmitted was not a German production, and points out that "Madame Butterfly" was written by an Italian, has an English title, scenes laid in Japan with an American hero.

Optimism, Not Pessimism

The Schaper Construction Material Company, 90 West Street, New York, is mailing cards to its list of customers which bears the following: "CHEER UP—There are no hard times coming. IT'S the soft times going." If more concerns would talk optimism instead of pessimism the country would be better off. The Schaper people are to be commended for their "boosting" attitude, and no doubt it will have some effect, for the reason that those who receive the cards will place them where they will be seen by others, the same as we are doing.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

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Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

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The HUDSON word counter counts up to 1,500 and is admirably adapted for press work as well as messages. This word counter has been on the market for over twenty years and has stood the test of time. Some of the original HUDSON word counters are still in every-day use, which testifies in the strongest terms to their value and lasting qualities. The HUDSON word counter costs $7.00.

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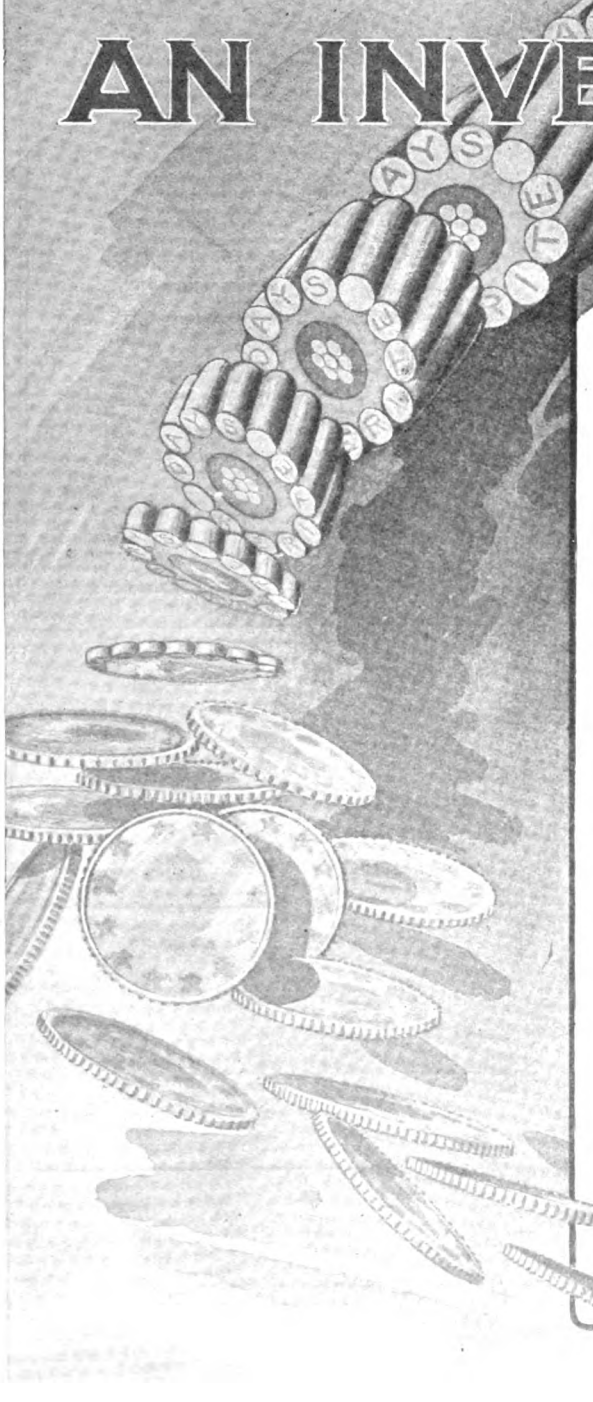
AN INVESTMENT



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THE RAILROAD

Telegraph and Telephone Section of the American Railway Association

The Telegraph and Telephone Section of the American Railway Association, will meet at the Hotel Cleveland, Cleveland, Ohio, on Wednesday, Thursday and Friday, September 21, 22 and 23.

The various committees of arrangements are now completing their work, and a well-attended gathering is expected.

W. T. Kyle, chairman, Telegraph and Telephone Appliance Association, New York, reports that arrangements are being made for exhibit rooms for all supply people who wish to make a display of apparatus, etc. The electric current available in the Hotel Cleveland, for exhibition purposes is 110 volts direct.

A joint meeting of representatives of Telegraph and Telephone Section, Committee No. 7, Inductive Interference, Telegraph and Telephone Section ot the American Railway Association, represented by L. Behner, I. C. Forshea and Stanley Rhoads, recently met an American Railway Engineering Association Sub-Committee on Electrical Interference, of which W. M. Vandersluis, signal engineer of the Illinois Central, Chicago, is chairman. The object of the meeting was intended to co-ordinate and divide the work of the two committees so that each will handle the work with which it is most familiar.

A MEETING of the Committee of Direction of the Telegraph and Telephone Section of the American Railway Association was held in Chicago on July 21st. Those present were: H. Hulatt, R. F. Finley, E. C. Keenan, J. F. Caskey, G. A. Cellar, E. A. Chenery, E. E. Dildine, G. D. Hood, C. S. Rhoads and W. A. Fairbanks. Considerable routine business was disposed of and committees appointed, etc.

F. H. VAN ETTEN has been appointed by the Chicago, Milwaukee and St. Paul Railway Company, supervisor of telegraph, telephone and signals, with headquarters at Terre Haute, Ind. Mr. Van Etten was formerly superintendent of telegraph of the Chicago, Terre Haute and Southeastern Railway, which was taken over by the Chicago, Milwaukee and St. Paul Railway Company on July 1st.

International Association of Municipal Electricians

The 26th annual convention of the International Association of Municipal Electricians will be held at Colorado Springs, Colorado, September 6th to 10th. Members are urged to make this meeting their vacation combined with the business of the Association.

The hotel headquarters and rates will be issued later in circular form by Clarence R. George, secretary of the Association, Houston, Texas.

The Ghegan Simplex Main Line Relay

A radical departure from the time-honored methods of adjusting the magnetic circuit of main line telegraph instruments has been devised by J. J. Ghegan, president of J. H. Bunnell and Company, New York.

Heretofore this adjustment has been done by varying the distance between the magnet cores and armatures by sliding the magnets back and forth.

Mr. Ghegan's method is to leave the armature and magnets in fixed positions in close proximity to each other, and vary the magnetic circuit by moving the yoke or back iron, on which the magnet spools have heretofore been permanently mounted, from contact with magnet cores to any desired distance away from one or both cores.

Mr. Ghegan's relay arrangement has some distinct advantages over the former types, such as the positive protection of the magnets and their connecting wires from mechanical injury by enclosing them in a suitable covering; simplifying the construction by eliminating sliding mechanism for the magnets, and by doing away with the back adjusting post.

The instrument is decidedly quicker in action, owing to the additional break in the magnetic circuit, as well as being more responsive to small current variations, perfect work being obtained on a variation of less than 2 milliamperes over a 100 ohm leak on a 3300 ohm circuit.

This is made possible by the closeness of the armature to magnet cores at all times, so that all lines of force go through the armature, whereas in the old arrangement of separating armature and magnet cores besides the pull being in inverse ratio to the distance, many of the lines of force passed directly from one core to the other, and thus had no effect on the armature.

The arrangement for moving the yoke or back iron is simple and ingenious and is accomplished by turning a nut exactly as in the old style relay, so that operators do not have to learn any new adjusting methods when using the instrument.

"REMCO"

ALTERNATING CURRENT SELECTORS

(Controlling Patents)

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Manufactured only by the

RAILWAY ELECTRIC MANUFACTURING CO.

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No German Cables Yet

Reports from Berlin that negotiations between the German Government and representatives of the Commercial Cable Company and the Western Union Telegraph Company regarding the laying of direct cables between Germany and the United States had been opened were characterized as "misleading" by officials of the cable companies mentioned. It was explained that while such negotiations were pending, there had been no change in the situation since about a year ago, when announcements of requests for cable concessions by both the Western Union and the Mackay interests were made.

No action with regard to the laying of direct cables will be undertaken either by the Western Union or the Mackay companies until the two existing direct cables between Germany and America have been allocated. These two cables, which were operated by the German Atlantic Telegraph Company, were seized by the Allies during the war. One of them is now being operated by France and the other by Great Britain. The first cable has been cut into Brest and the other has been connected to provide communication between Halifax, N. S., and Penzance, England. Allocation of the German cables is in the hands of the International Communications Conference.

Officials of the companies said that the German Government would await the final decision of the International Communications Conference before acting on requests for the laying of new cables.

Western Union Loses in Court

The Western Union Telegraph Company will be forced to move its poles and wires from every foot of the right-of-way of the Louisville and Nashville Railroad between the Tennessee line and the Mississippi line under decisions of the supreme court of Alabama rendered during the closing hours of the 1920 term. It became known on July 2nd that the court had affirmed the judgment of the Montgomery circuit court, which was adverse to the contentions of the telegraph company.

This does not necessarily mean that the poles and wires must be moved at once, as the telegraph company may appeal to the supreme court of the United States.

Have a Definite Aim

Men continually fail for lack of a definite aim. The man who is perpetually hesitating which of two things he will do first will do neither. The man who resolves, but suffers his resolution to be changed by the first counter-suggestion of a friend —who fluctuates from plan to plan and veers like a weather-cock to every breath of caprice that shows —can never accomplish anything real or useful. It is only the man who first consults wisely, then resolves firmly, and then executes his purpose with inflexible perseverance, undismayed by those petty difficulties that daunt a weaker spirit, that can advance to eminence in any line.—William Wirt.

Ira N. Hollis, past president of the American Society of Mechanical Engineers, in presenting an illuminated address from the engineering industries of the United States to the British Institution of Civil Engineers, at London recently, said that the great issue of the twenieth century was the right of every man to earn a living and to develop his utmost possibility, physically and mentally, without being forced into the membership of some organization, and without being controlled by powerful combinations of any kind.

Heroes' Memory Honored by Great Industrial Athletic Field

To honor the memory of the forty-nine Western Electric men who died fighting for their country, the Western Electric Company has just presented to its employees a completely equipped ten-acre athletic field. It is located just to the west of the company's works near Chicago, and includes the area between 22nd and 23rd Streets and 49th and 50th Avenues.

The Government telegraph operators in Italy, who struck for higher wages and better conditions recently, have apparently lost the strike. Most of the strikers have returned to work without securing any advantage.

W. H. Sawyer, of Providence, R. I., well known in telegraph and electrical circles, now retired, and who is Number One in the American District Telegraph service, having been one of its founders, in renewing his subscription for another year, writes: "I shall continue the paper as long as I'm permitted to exist and as I am to be seventy-six on the nineteenth of August, I trust I may see many annual bills from you. 73."

The Baudot Printing Telegraph System

The issue of a second edition of the "Baudot Printing Telegraph System," by H. W. Pendry, is fully justified by the extension of the use of that system in the United States and in Europe, the improvements made in the apparatus, and the general adoption of the first edition as a class manual.

The descriptions and diagrams of somewhat intricate instruments and connections are so clear that it is possible to obtain a good knowledge of the system from the book alone, without the necessity of seeing and using the instruments before the information in the book can be said to have been usefully assimilated.

Of the new matter introduced, the most notable is that treating of the Murray phonic motor and the Gulstad Relay. The chapters on Duplex Baudot and Baudot repeaters has been enlarged. The number of illustrations and diagrams has been increased from 72 to 94. The price of the book is $2.50 per copy, and orders should be addressed to Telegraph and Telephone Age, 253 Broadway, New York.—Advertisement.

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All America Cables

CARRYING Messages, by John L. Merrill, president of the company, is the title of a booklet measuring 3½ inches wide by 6¼ inches in length, and containing fourteen pags. It is a cleverly prepared story. It starts out with the history of the "Carrying of a Message to Garcia," and then follows a brief history of the company, and much other information of value.

CABLE steamer *Faraday* has arrived on this side of the Atlantic with the cable to connect Guantanamo, Cuba, with Ponce, Porto Rico.

W. A. BEHAGEN has been appointed acting manager at La Libertad, Salvador, vice E. O. German, coming to New York on sick leave.

C. S. HAMILTON has been appointed manager of the newly established station at Ponce, Porto Rico.

C. H. CRISSON has been appointed manager of the new station at San Juan, Porto Rico.

OPERATORS G. Rosenthal, A. P. Burke, L. C. Henderson, L. C. Proudfoot, W. J. Hoy and William Hayes, Jr., have been assigned to the Porto Rican stations.

East Coast

W. S. BUCHANAN, general representative of All America Cables in South America, who has been attached to the headquarters staff, New York, while recuperating his health, is returning to his post at Buenos Aires by steamer *Huron*, sailing August 3rd. He will be accompanied by W. P. Massie, who has been appointed commercial representative at Rio de Janeiro.

GEORGE W. LEWIS has been appointed commercial agent in Chile, resident at Valparaiso, and sails for his post on August 3rd.

FRANK W. PHELAN, general commercial superintendent, has returned from his trip through South America.

J. G. MURRAY, traffic superintendent, is on vacation.

Radio Corporation of America

PRESIDENT E. J. Nally returned from Europe July 23rd on the *Aquitania*.

GENERAL Manager David Sarnoff recently spent a week-end at the Belmar high power station.

A. E. ROACH, assistant chief engineer, and W. A. Graham, operating engineer, recently inspected the stations at Tuckerton, New Brunswick and Marion.

Radio Telegraphy

At a recent conference in London of the Prime Ministers of the Empire, a committee was appointed to consider the practical means available at the present time for developing Imperial communications by land, sea, air, cable, and wireless telegraphy and telephony.

Obituary.

ALBERT TAYLOR, aged fifty-seven years, manager of the North Atlantic District, of the Electric Storage Battery Company, and well known in the electrical industry, died suddenly on July 6th. Mr. Taylor was taken ill in his office, 23 West 43rd Street, New York, and died a few hours later in the hospital. He was buried from his home in New Rochelle on July 8th. In 1898 Mr. Taylor entered the employ of the Electric Storage Battery Company as a salesman in their New York office. In January, 1900, he was made assistant manager, and in March of the same year, was appointed manager of the New York office.

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THE East Indian Government has established a separate department to deal with all matters connected with civil wireless telegraphy.

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G. D. HOOD, superintendent of telegraph of the Chicago, Rock Island and Pacific Railway Company, writes: "Enclosed find $2.00 to cover the renewal of my subscription for another year. I appreciate your action in re-entering my name on your books, which precludes my missing any issue of the publication."

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Herbert's Book on Telegraphy

The Fourth Edition of Herbert's "Telegraphy" was placed on the market in December. The price of this enlarged book of 1,020 pages is $6.50 per copy. This work is a detailed exposition of the telegraph system of the British Government, and has been thoroughly revised as well as enlarged. It not only describes the English telegraph systems, but other systems which are of direct interest to American practice.

The chapter on Secondary Cells or Storage Batteries has been extended and brought up to date. A description of the Kleinschmidt Perforator is also found in this book.

Appendix C on the Gulstad Relay has been rewritten in view of the adoption of this relay on so many long and difficult circuits.

In the Addendum following the Appendix there is an elementary account of the amplifying wave.

The use of small currents to enable telegraph and telephone circuits to be worked in the same cable has far-reaching consequence in the English telegraph practice, and it is fully covered.

A chapter is also devoted to the Vibroplex. Experiments are being made to ascertain whether its adoption lessens the strain on the telegrapher, reduces the liability to "cramp," and increases the output of work.

Those desiring copies of this valuable book should address and make remittances to John B. Taltavall, Publisher, TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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PERSONAL

WILLIAM GELLATLY, president of the Gamewell Fire Alarm Telegraph Company, New York, sailed for Europe on the steamer *Celtic* on July 23rd, to be absent some time on business and pleasure.

THOMAS S. BRICKHOUSE, in charge of the leased wire system of E. F. Hutton and Company, New York, has just returned from an extensive business trip in the South and Middlewest West. He is decidedly optimistic regarding the future. Everywhere he found conditions favorable for an early return to normal.

POSTAL TELEGRAPH-CABLE COMPANY

E. P. TULLY, assistant to the general manager, is visiting Boston and other points in eastern Massachusetts and Maine.

J. F. LOGAN, manager at Pottsville, Pa., is receiving the congratulations of his friends on his recent marriage. S. F. Higo, of Reading, took his place while he was absent.

J. T. JOHNSTON is acting manager at Wilmington, Del., on account of the serious illness of Manager C. B. Young.

C. R. HULSE, well known in Philadelphia telegraph circles, has been appointed manager of the branch office at 49 South 3rd Street, Philadelphia. C. Baab, manager at Eighth and Wood Streets branch, has been advanced to the more important place of manager at No. 58 North 12th Street branch, Philadelphia, vice C. W. Kofink, deceased.

MISS N. Benadum is in charge of the newly opened branch in the New Willard Hotel, Washington. E. J. Oliver is night operator there.

A NEW office has been opened at Fillmore, California, with Roy Neugebauer as manager.

THOMAS J. DOUGHERTY, an operator in the Philadelphia, Pa., office, died recently. He formerly worked in the New York main office, where he had many friends. The entire force extends sympathy to Mrs. Dougherty.

PHIL ANNELLO, of the New York office, was married on June 29th to Miss Meta Thomsen of the New York Telephone Company.

MISS Emma Hassell, the young lady that gives us our vouchers on pay day, surprised us by announcing her marriage to Anthony Salimone.

AMONG the executive office callers on July 22nd was H. R. Cook, manager of the Norwich, Conn., office, while enroute to Easton, Pa., to which management he had been promoted.

MANAGERS appointed: B. J. Palmer, Concord, N. H.; I. Rubin, Suffern, N. Y.; W. S. Tucker, Thomasville, Ga.; J. Heck, Wilkes-Barre, Pa.; E. M. Thornsberry, Newton, Kans.; L. J. Barrett, Lake Placid, N. Y., and J. L. Mayo, Dyersburg, Tenn.

Chicago

GENERAL Superintendent E. W. Collins is on an extended inspection trip at Denver and other offices throughout the fourth district.

GENERAL Superintendent of Plant C. M. Baker recently visited Cleveland, Columbus, Wycliffe and other Ohio points in connection with plant department matters.

SUPERINTENDENT J. G. Blake, accompanied by Division Engineer W. L. Simpson, recently visited Peoria, Ill., in connection with a proposed location for a new office.

DIVISION Engineer W. L. Simpson also was a recent visitor in Kansas City in connection with long distance telephone and high tension problems.

A. C. JOHNSON, of Division Engineer Simpson's office, has just returned to his desk after a vacation in Michigan.

SUPERINTENDENT L. R. Thomas is making an inspection trip of the mining section of Northern Michigan.

PAUL HENKEL, aged seventy-one years, manager of the La Junta, Colo., office of this company, died on June 20th. He was born in Ohio and held many important telegraph positions. He was at one time night chief at St. Paul. He worked in Chicago, and served as an operator for the Board of Trade for several years. For over twenty years past he had worked for the Postal Company, as manager of various offices. Superintendent W. C. Black of Denver, in commenting on Mr. Henkel's passing away, said: "Paul was a good man in the telegraph business because he was dependable and on the job. He knew what to do when called in on a circuit and was always there to be called in. I held him in high esteem. He took his pleasure in life in his work—in doing good work. We will all miss him." Interment was at Dodge City, Kans., under Masonic auspices.

EDWARD REYNOLDS, vice-president and general manager of the Postal Telegraph-Cable Company, New York, writes: "I am very glad that you went ahead and renewed my subscription, because I would not want to be without the paper. Enclosed find my check for the $2.00."

Cable Now to Antwerp

The Commercial Cable Company has announced an extension of its cables from London to Antwerp. This extension gives the company facilities for direct transmission of messages from New York to the Belgian city.

Clarence H. Mackay, president of the company, in making this announcement stated that within a fortnight he expected his company would establish direct connections with Amsterdam, Holland.

Cable Map of the World

The International Bureau of Communications, located at Berne, Switzerland, has issued a map showing the cables of the world. The map measures 21 inches long by 25 inches wide. There are fifty-five submarine cables shown on the map. Copies can be obtained at 50 cents each from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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WESTERN UNION TELEGRAPH CO.

COINCIDENT with departmental changes in the Plant and Engineering Departments, effective as of July 16, the following changes have been made in the traffic department's organization in New York:

Traffic Engineer discontinued, H. A. Emmons transferred to engineering department.

Automatic studies engineer discontinued, C. J. Walbran transferred to engineering department.

Plant layout and routing engineer changed to circuit layout and routing engineer, H. Mason transferred to engineering department and G. E. Palmer appointed circuit layout and routing engineer.

Title of E. R. Shute, general supervisor of traffic costs, changed to operating engineer, as better fitting the added duties.

Under this rearrangement, the supervisory engineering work which has heretofore been under the direction of the traffic engineer, being essentially traffic, will continue under the direction of the traffic department and will be cared for by the operating engineer, the circuit layout and routing engineer and the office layout engineer.

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Eastern Division

GENERAL Manager T. W. Garroll has returned to his office after an enjoyable and well-earned vacation.

C. R. TILGHMAN, general supervisor of ticker service of general superintendent of plant, W. C. Titley's staff, spent the month of July in Colorado Springs, Colo.

E. R. TRETLER, formerly of Superintendent Maxwell's office, Jacksonville, Fla., is now with Superintendent F. R. Veale, New York.

THE following summer offices, in the third district, have been opened: Spring Lake, Wildwood and Ocean City, N. J., Watch Hill, R. I., Griswold Hotel, New London, Conn., and Narragansett Pier, R. I.

MISS B. F. Deyoe, formerly manager, Brocton, N. Y., has been transferred to Yonkers as night manager.

H. W. VAN SICKLEN has been transferred from Middletown, N. Y., to Yonkers as manager. He was succeeded by Geo. E. Corwin.

B. S. COUGHLIN, manager at Amsterdam, N. Y., has resigned to take a position with the Associated Press. Miss Ruth E. Daniels is acting manager temporarily.

G. B. LOZIER, formerly of Buffalo, has returned from a long illness, and is now at Alexandria Bay for the summer.

MRS. Jean Oliva, of the metropolitan division, has been transferred to Monticello, N. Y., for the summer.

H. D. SCHATZMAN, formerly manager at Flushing, L. I., has been assigned to Fallsburg, N. Y., as manager, and Miss Rebecca Mitchell, of New York, has been assigned to the same office to help out.

MISS Lillie Burns of Dunkirk, N. Y., is in charge of the Lake Placid, N. Y., office for the summer. Mary Geisel, formerly manager at Potsdam, N. Y., has been assigned to the same office.

GEO. A. ZIMMERMAN, formerly with the American Expeditionary Forces, has been assigned to Plattsburgh, N. Y., for the summer.

MISS Louisa Stephens, formerly manager, Newark, Ohio, has been assigned as manager at Ossining, N. Y.

C. E. KING, of the Southern Division, has accepted the management of the Clarksburg, W. Va., office.

L. A. SHEW, of the Harrisburg, Pa., office, has joined the Order of the Benedicks and he has the best wishes of his associates.

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Lake Division

CHANGES in managers: Steubenville, Ohio, A. E. Rowles, vice C. E. Enyart, transferred; Middletown, Ohio, W. E. Baxley, vice R. S. Gibbons, resigned; Greenville, Ohio, L. J. Mannix, vice H. N. Ullery, transferred; Circleville, Ohio, C. W. Clark, vice J. E. Thomas, resigned; New Philadelphia, Ohio, N. A. Johnson, vice F. L. Gieberson, resigned; Niles, Ohio, Clair Fellows, vice F. H. Hoover, resigned; Xenia, Ohio, E. A. Densmore, vice L. N. Taylor, transferred, and Wellston, Ohio, T. P. Howard, vice C. W. Clark, transferred.

MANAGER Walter Branch, of Middleport, Ohio, was recently retired on pension after having completed fifty-three years continuous service in that office.

CANTON, Ohio, was recently made a functional office, with Manager C. A. Gosser remaining in charge of commercial department matters, C. A. Dister being appointed as chief operator in charge of traffic operations. At the same time multiplex operation with Cleveland was inaugurated, resulting in greatly increased efficiency in the handling of traffic between the two points.

CLASS one — independent — offices have been opened at New London, Willard and Dennison, Ohio, increasing the number of such offices in Ohio to 109, exclusive of Cincinnati, Cleveland, Columbus and Toledo, all of which are divisional offices reporting direct to the general manager.

A SUMMER office has been opened at Cedar Point, Ohio, tributary to Sandusky.

F. E. D'HUMY, of New York, was a recent visitor to Cincinnati.

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Toledo, Ohio

V. EVERETT JOHNSON, installer for the Western Union Telegraph Company, with headquarters in Cleveland, and Miss Violet Berlein Beebe, receiving clerk at the Toledo main office, were married on July 2.

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NIGHT Chief Operator L. E. Johnson surprised his many friends when he slipped away to Charlotte, Mich., on June 25th, where he was married to Miss Lou Snyder.

MISS Ora N. Stair has returned from Bowling Green, Ohio, and will assist in vacation relief work at branch offices.

J. H. PENDRY, division cashier at Chicago, is on a furlough again on account of illness, the benefit of his long sojourn in Colorado proving less lasting than his friends had hoped.

C. R. FISHER, division traffic superintendent at Chicago, considers it hard lines that his recent transfer from San Francisco should have put him into the Lake Division for the hottest summer in fifty years. His friends' efforts to console him with quotations from the weather report, indicating a mean temperature of 54 at San Francisco do not meet with conspicuous success.

W. C. TITLEY, general superintendent of plant, was a recent visitor at Chicago, enroute to take up his new work in New York.

M. H. CLAPP, of Vice-President Atkins' office, New York, was in Chicago recently.

CITY Superintendent Herbert Brown, of Chicago, is showing with much pride photographs of his new bungalow in North Evanston, and has become an authority on the flora and fauna of Cook County since his removal to the suburbs.

C. F. MATSON, chief clerk to Division Auditor Milne, has been spending his vacation at his old home in Iowa.

CHAS. GALLAGHER, chief clerk to Superintendent McGrath, and Walter Schroeder, of the general manager's office, were both exhibitors in the recent display of aquaria in the Art Institute, Chicago. This is an annual affair under the auspices of the Chicago Aquarian Society, designed to stimulate competition in the making and arranging of private collections of water plants and rare fish, etc.

E. S. BOWERS, supervisor of complaints and claims in Superintendent Boening's office at Detroit, is, with his daughter Virginia, spending a brief period with relatives at Richmond, Ind.

CHARLES M. MCCANN, chief clerk to the general manager, Chicago, is spending his vacation, with his famliy, in Colorado. In his absence, M. F. Strider is in charge of the office.

MIKE FINAN, of Cincinnati, was elected delegate by Local No. 51, Association Western Union Employees, on July 14th, to the Lake Division Assembly at Chicago, August 9th.

THE sympathy of the force at Cincinnati is extended to Night Supervisor R. G. Zimmerman, whose daughter died on July 7th.

"GOOD-BY and God bless you all." That was the farewell spoken by Richard M. Molloy, late night wire chief of the Cincinnati office, when he recently quit work after forty-five years' service. Mr. Molloy has been retired on a pension.

Indianapolis

WILLIAM MAHONEY, service clerk, handled a service message of non-delivery, and asking for better address for a message addressed to Jack Eaglesfield, Tennis Association Headquarters, Sheridan Hotel, Chicago. The sender could not give better address, so Mr. Mahoney got a Chicago paper and found out where there was a tennis tournament on in Chicago. The message was delivered—thanks to good head work on the part of Mr. Mahoney This class of work wins.

WILLIAM C. TITLEY

William C. Titley, general superintendent of plant (land lines), New York City, was born in Chicago on October 6, 1877.

He was reared in Chicago and attended its public schools and Manual Training High School, graduating in 1894. Soon thereafter he entered the employ of the Chicago Telephone Company and worked for that company until 1898, when he went to Alaska, where he engaged in railway surveying work, prospecting, etc. In 1901 he returned to the Chicago Telephone Company and was promoted from time to time to assistant chief draftsman, assistant general foreman construction division, and in 1905 he was appointed general foreman. In 1906 he was made assistant superintendent of construction for the city of Chicago and in 1907 assistant construction engineer. From 1908 until 1910 he was plant engineer for Chicago, and in October 1910, was transferred to the Western Union Telegraph Company as district plant superintendent for the Chicago District. He was very successful in this work and in 1911 was transferred to Denver as division plant superintendent of the Mountain Division, which position he held until July 16, when he was appointed general superintendent of plant (land lines), New York, reporting to the president.

Mr. Titley is an excellent executive and has always been able to select able men as assistants and to get their whole-hearted support. He built up in the mountain division, an organization that was known throughout the country for its initiative and co-operative spirit. It was with sincere regret that his fellow-workers saw him called away to other and higher fields of endeavor, but he will still receive their loyal support in his new position.

On July 9th, at the Albany Hotel, Denver, he was given a farewell dinner, which was attended by employees of all departments. Those present pronounced it one of the most delightful dinners they had ever attended.

HARRY E. BIGGLE

Harry E. Biggle, division plant superintendent, mountain division, Denver, Colorado, was born at Volga, Iowa, December 23, 1880. He was reared in Rock, Mo., where he attended public schools and high school, graduating in 1900. Immediately afterwards he entered the postal service of the Government, where he spent two years, leaving that

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work to attend commercial college at Quincy, Ill. After completing his business education, he worked for one year in the mechanical department of the Burlington Railroad, and two years with a banking and investment company in Denver.

In February, 1906, he was appointed chief stenographer in the material and supplies division of the Isthmian Canal Commission at Empire, Canal Zone, Panama. He won rapid promotion, having been made assistant chief clerk and chief clerk in less than six months. He resigned this position in August, 1910, to return to the United States on account of impaired health of his wife.

Mr. Biggle entered the service of the Western Union Company in September, 1910, as stenographer in the office of the general superintendent, mountain division. Early in 1911 he was transferred to the plant department as estimate clerk, and in 1912 was appointed chief clerk, which position he held under Division Plant Superintendent Titley until the latter's recent promotion.

Effective July 16, Mr. Biggle was appointed division plant superintendent, mountain division, to succeed Mr. Titley. In this position he will be the youngest of the division superintendents. He has initiative, a host of friends, and will get the loyal support of all his assistants, etc.

EDWARD A. BAIRD, city superintendent, Western Union Telegraph Company, Syracuse, N. Y., in remitting to cover his subscription for another year, writes: "It requires a small sum indeed to insure receipt of a valuable message twice a month."

International Radio Telegraph Company

GEORGE E. COLE, traffic superintendent, has completed an inspection trip to the Cape May station WCY. Chief Operator W. P. Kent at that station reports that the "break-in" equipment installed some months ago, is of great assistance in handling traffic through interference.

WESTINGHOUSE Heterodyne receivers, with wavelength range from 200 to 5000 meters, have been placed in the five International Company coastal stations now open to general public correspondence. They are giving splendid results and have in each case extended the receiving range of the station by a substantial percentage. Daily logs show repeated instances of traffic interchange under conditions which could not be overcome with less selective and effective apparatus.

JOHN V. L. HOGAN, manager, has been assisting in the revision of the National Electric Code as it applies to the fire hazard in radio telegraph and telephone stations. The new code is expected to distinguish between stations having transmitters and those which are used for receiving only, so that experimenters interested only in the reception of messages will not be subjected to the expensive protection requirements so essential in sending stations.

R. P. WOODFORD, who is not only a top-notch radio man, but also a cable operator of long experience, has resigned from the Brooklyn station staff in order to go West. His trick has been taken over by P. L. McPhail, who has been with the company for some time and has demonstrated his ability to handle business fast and accurately under the pressure of a heavy traffic station such as WCG.

ALL International Company coastal stations are operating under the Department of Commerce agreement, which has done a great deal to lessen interference on the 600 meter ship-service wave. This agreement provides that coastal stations shall not call ships at sea unless traffic for them is on file; consequently, the ship operators having messages to get off should take the initiative in calling. Experience has shown that if one shore station is busy and does not answer the first call, some other International station is always within range and ready to give immediate service when called.

H. L. HAZELBAKER, who has been representing the operating department at Belfast, Maine, during erection of the high-powered station to be opened there, has been temporarily transferred to New London, Conn., WLC, in order to keep that station's staff complete during the vacation period. Marine operators will remember Mr. Hazelbaker as the chief of Cape May WCY from its opening until last November, when he left for Belfast, and W. P. Kent was promoted to chief operator at WCY.

Wireless Telephony

The Nauen, Germany, Telefunken station established wireless telephonic communication over distances of 2,700 miles. Before long it is hoped to establish telephonic conversation between Berlin and New York.

Western Union Men Win

Supreme Court Justice Donnelly of New York on July 19th denied a motion to adjudge Newcomb Carlton and other officials of the Western Union Telegraph Company in contempt because they refused to appear before Hobart S. Weaver, commissioner appointed to take their testimony in an action now pending in Tennessee, after Justice Tierney had signed subpoenas directing them to appear. Justice Donnelly held that an order to show cause why the officials should not be declared in contempt was premature, and what should really have been applied for was an order to show cause why they should not be compelled to testify. He gave leave to apply for such an order.

Their testimony is wanted by the Nashville, Chattanooga and St. Louis Railway Company, in the railway's protest against damage awards in a condemnation proceeding started by the telegraph company to build a telegraph line along the railroad's right of way. Attorneys for the telegraph officials contend that evidence sought through the examination of officials is already obtainable in Tennessee and that the examination would not only be an unjustifiable hardship on the officials, but would delay the action in Tennessee.

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Important Additions to Phillips' Code

The following additions to Phillips' Code have been authorized, and they are correct to August 1, 1921:

Adly—Admirably.
Adlty—Admiralty.
Dap—Disappear.
Dapc—Disappearance.
Dapd—Disappeared.
Dapg—Disappearing.
De—Defense.
Dhg—Discharge.
Dhgd—Discharged.
Dhgg—Discharging.
Dhgs—Discharges.
Dve—Defensive.
Hod—Holland.
Indf—Indefinite.
Indfy—Indefinitely.
Iprm—Imprisonment.
Iprn—Imprison.
Ita—Italy.
Itan—Italian.
Mex—Mexico.
Mexc—Mexico City.
Ofe—Offense.
Ofv—Offensive.
Oprn—Operation.
Rpz—Repulse.
Rpzd—Repulsed.
Rpzg—Repulsing.
Srv—Survive.
Srvd—Survived.
Srvg—Surviving.
Srvr—Survivor.
Stam—Statement.
Sup—Supply.
Supd—Supplied.
Supg—Supplying.
Sups—Supplies.
Tsd—Translated.
Tsg—Translating.
Tsl—Translate.
Tsn—Translation.
Uofl—Unofficial.
Uofy—Unofficially.
Usfy—Unsatisfactory.
Vsl—Vessel.
Vsls—Vessels.
Zap—Seaport.

Kpn—Comprehension (now competition).
Kptn—Competition.

And the following should be added:

Cpx—Complex.
Dmj—Damage (and its derivatives).
Pnk—Precinct.
Rel—Reëlect.
Reld—Reëlected.
Reln—Reëlection (and other derivatives).
Rkt—Recruit.

A supplement issued by The Associated Press comprises the following:

Acf—Aircraft.
Asfd—Asphyxiated.
Asfg—Asphyxiating.
Asfn—Asphyxiation.
Asfx—Asphyxiate.
Bjcy—Belligerency.
Bjt—Belligerent.
Chlr—Chancellor.
Cmy—Commissary.
Cnt—Count.
Cz—Cruise.
Czd—Cruised.
Czg—Cruising.
Czr—Cruiser.
Etgd—Entangled.
Etgl—Entangle.
Etgm—Entanglement.
Etnh—Entrench.
Etnm—Entrenchment.
Fht—Fight.
Fhtg—Fighting.
Fntr—Frontier.
Hyap—Hydroaeroplane.
Hyp—Hydroplane.
Itv—Intervene.
Itvn—Intervention.
Kcp—Conscript.
Kcpn—Conscription.
Mutn—Munition.
Nql—Neutral.
Nqy—Neutrality.
Pmr—Premier.
Pnu—Pneumonia.
Psur—Pressure.
Smj—Submerge.
Smjd—Submerged.
Smjg—Submerging.
Subm—Submarine.
Tph—Torpedoboat.
Wf—Wife.
Zpn—Zeppelin.

"Inpc" for "Independence" and "Inpy"—"Independently" are constantly used. Many derivatives of root words were not carried out to their final terminations where the order of formation followed the regular and ordinary law, a lack of space precluding a more extended work. Thus: "Stn"—"Station," "Stnd"—"Stationed," "Stng"—"Stationing," etc.; "Sta"—"State," "Stad"—"Stated", "Stam"—"Statement," etc.

INDUCTIVE interference is the designation applied to electromagnetic induction when the property of electricity instead of being the servant which runs our machinery, goes wrong and plays havoc with telegraph and telephone circuits.

Vacuum Tubes a Live Subject

The subject of vacuum tubes is certainly a live one in these days. Inquiries for information on this subject come from all parts of the world. There are two books on the market devoted exclusively to vacuum tubes and it will be well for students and others to have copies of one or both of these valuable works.

Vacuum Tubes in Wireless Communication, by Elmer E. Bucher, price $2.25 per copy, is an elementary text book for students, operators, experimenters and engineers. It tells in understandable language the fundamental operating principle of the vacuum tube. It shows over one hundred different circuits for the practical use of the vacuum tubes as detector, radio or audio frequency amplifier, regenerative receiver, beat receiver and generator of radio frequency currents. More than one hundred diagrams reveal, step by step, in simple and direct form, the uses of the vacuum tube.

Thermionic Vacuum Tube, by Dr. H. J. Van Der Bijl, price $5.00 per copy.

The rapidly extending use of the vacuum tube as a receptor of radio waves; generator of radio oscillations; telephone repeater; alternating current rectifier, and for other purposes, has made the instrument one of the most widely discussed inventions of recent times.

Dr. Van Der Bijl, in his book, gives a thorough treatment of the entire subject of thermionics as related to vacuum tube phenomena.

The book has 282 pages and 232 illustrations.

Copies of these books or any others may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

Books, Hobby of Mr. Vail

It is significant of the life and career of Theodore N. Vail that he was a great lover of books. Especially was he interested in those rare old histories of the early days in America, says the *Telephone Review*. He also had a wonderful library of telephone and telegraph books, containing valuable records which will be preserved for future generations.

How few persons nowadays even read, much less collect, the worth-while books with their wealth of information and inspiration. Cultivate good books as you would good friends. They will never fail you.

MANY newspapers lately have printed reports to the effect that the United States Government had issued a permit for the Western Union Telegraph Company to land its Barbados cable at Miami, Florida. This report was erroneous. What the Government did do, was to grant the Western Union Telegraph Company permission to make repairs on that portion of the cable already laid, but with the understanding that no attempt will be made to connect it with the Barbados end.

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CONTENTS

Theory of the One Thousand Line System. By Harry E. Hershey. (Continued from page 340, August 1st issue) 362
United States Navy's Communication Systems in France. By Samuel W. Beach, U.S.N. 364
The Origin of the Symbol "O.K." David Homer Bates. Marconi's Latest Work 366
Dr. John Ambrose Fleming, F.R.S. First Aid for Telephone Companies 367
Telegraph Keyboard Perforators. By A. C. Booth 368
The View From the Top of 195 Broadway. German Radio Developments 369
The Evolution of Signs, Signals and Signalling 370
Student's Course in Technical Telegraphy. By Louis Casper. Lesson 33 371
Death of "Senator" Wm. L. Ives. Obituary 373
The Editorial—The Public Holding Back Their Purchases. Institute of Radio Engineers Standardization Committee. A German-English-American Patent Agreement. A Big Price Paid for a Small Ill-Gotten Gain 374
The Railroad—Is the Telegraph and Telephone Section of the American Railway Association of Value to Telegraph Department Men? By H. Hulatt, Montreal 377
Alexander P. Achimore to Enter Business Field 378
New Western Union Office at Memphis. By W. V. McGuinness. The Distribution of Radio Literature 379
Personal. Postal Telegraph-Cable Company 380
Western Union Telegraph Company 381
Western Union in New Quarters at Salt Lake City. All America Cables. International Radio Telegraph Company 382
Radio Corporation of America. Contract for Poland Radio Consummated. Empire Radio Development. Observations From China... 383
Asylums a Necessity. Radio Transmits Photographs Over Breadth of Ocean. A Sure Way to Sell Bonds 384

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Theory of the One Thousand Line System

By HARRY E. HERSHEY,
Of the Automatic Electric Company, Chicago.

(*Continued from page* 340, *August* 1 *Issue*)

In our discussion up to this time we have been considering only a connector system, which limits the size of our exchange to one hundred lines. We will now take up the discussion of a thousand line system. Imagine, if you will, one thousand lines divided into ten groups of one hundred lines each. In each group there will be ten connectors, the banks of the ten connectors for any given group will be multiplied, and each connector will have access to all lines in its own group. If we wish to call telephone number 563, it is first necessary that we obtain access to one of the connectors in the 500 group, after which we will dial 63 and obtain the connection in the manner with which we are already familiar. It makes no difference to us which one of the ten connectors we use, as all of them have access to line number 63.

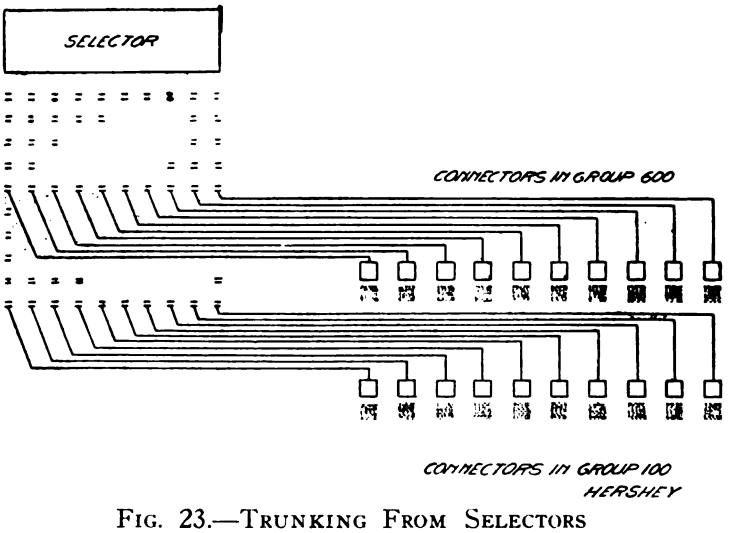

FIG. 23.—TRUNKING FROM SELECTORS

In order to obtain access to one of these connectors we must supply a new piece of apparatus, which is called a Selector. For the present let us assume that each line terminates on one of these selectors. If we dial 6 this selector will pick out an idle connector in the 600 group, by means of which we can complete a connection to any telephone in that group. If we had dialed 3, this ac-

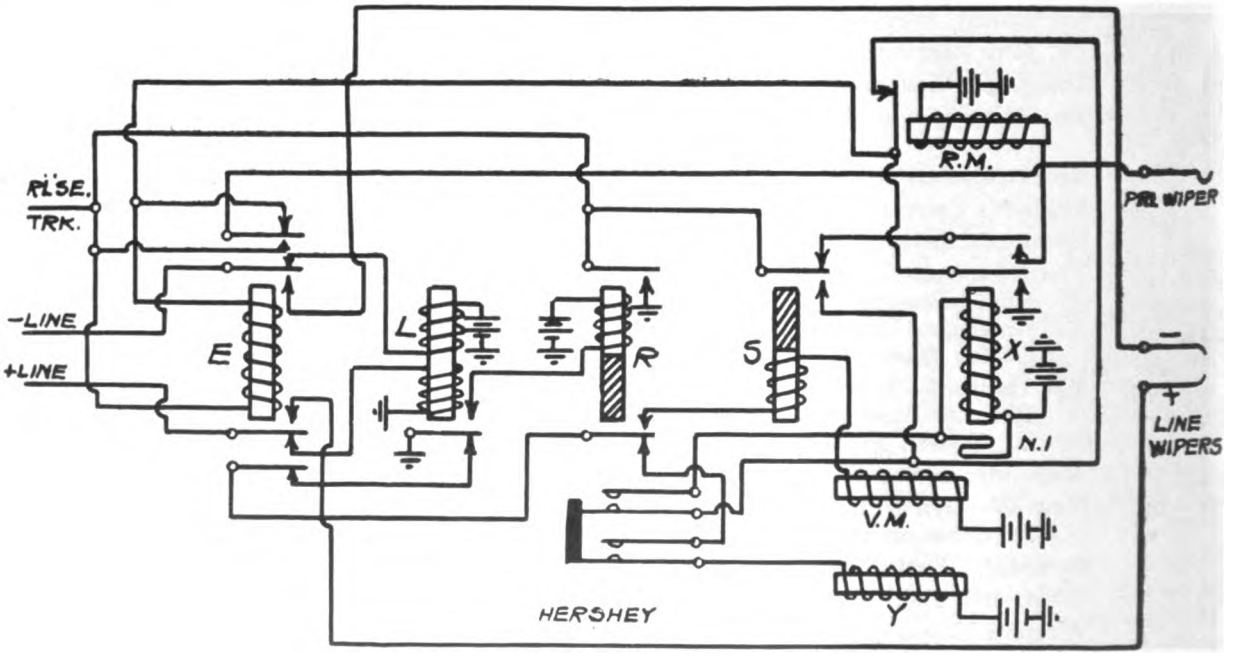

FIG. 24.—POWELL SELECTORS

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commodating selector would have picked out an idle connector in the 300 group, etc.

In Fig. 23, a selector is indicated by means of a rectangle. The mechanical structure of a selector switch is similar to that of a connector, i. e., it can impart a vertical and rotary motion to a shaft and wipers. Just below the selector is shown a line bank (in practice a selector carries both a line bank and a private bank, but for the sake of clearness the private bank is not shown).

At the right of the figure is shown a group of connectors that have access to all the lines in the 600 group; just below them is shown a group of connectors that have access to all the lines in the 100 group. It will be seen that the contact 6 up and 1 in of the selector bank leads to the first connector in the 600 group, and that the contact 6 up and 2 in leads to the second connector, etc. These trunks are represented by one line, but in reality they consist of positive and negative line, and release trunk. Although two levels only have been shown, it is to be understood that each contact in the selector bank leads to a corresponding connector in a group associated with the particular level of which the bank contact is a part.

It only remains for us to provide a circuit, by means of which the selector shaft can be raised to the desired level in response to the dial impulses, and following which the selector will automatically rotate the shaft until an idle trunk is found, after which it must extend the connection to the selected connector switch.

If we provide each line with an individual selector, the cost of the system will be excessive, as it was found to be in our connector system. Therefore, in practice, the lines terminate on line switches, which have access to trunks leading to the selector switches.

The Powell Selector

This selector is mechanically an exact duplicate of the connector switch, the only difference being in the circuit arrangement. Referring to Fig. 24 we find the familiar line relay L, release relay R, series relay S, release magnet Y, vertical magnet VM, and rotary magnet RM. In addition, there is a switching relay E having a resistance of 1,300 ohms. The private control relay X as used in this circuit is of 210 ohms resistance, and is purposely made very inefficient, so that it will not operate when in series with the switching relay E.

We will assume that the connection has been extended to the selector shown in Fig. 24, and that the calling subscriber now dials the figure 6. The line relay, release relay, and series relay will operate in the usual manner and cause six impulses of current to be sent through the vertical magnets. When the series relay energizes (at the first vertical impulse), a circuit is closed from ground, make springs relay R, make springs relay S, off normal springs (which are now closed, since the shaft has been raised one step), private control relay X, to negative battery. The private control relay will energize and form a locking circuit for itself which may be traced from ground, make springs relay X, break springs rotary magnet, off normal springs, relay X, to negative battery. When the series relay de-energizes (a fraction of a second after the last vertical impulse passes through it), a circuit may be traced from ground, make springs relay R, break springs relay S, make springs relay X, rotary magnet, to negative battery. The rotary magnet will energize over this circuit and operate to rotate the shaft and wipers into engagement with the first set of contacts in the sixth level of the bank. In addition, the rotary magnet opens the locking circuit of relay X, which in turn will de-energize and open the circuit of the rotary magnet. Let us assume that the first private bank contact is idle. As soon as the rotary magnet de-energizes a circuit can be traced from ground, make springs relay R, relay E, break springs rotary magnet, off normal springs, relay X, to negative battery. The relay X, due to its construction, will not energize in series with the switching relay E. Relay E will, however, energize over the above traced circuit and operate to extend the connection to the connector switch in the manner with which we are familiar. Attention is called to the fact that when the switching relay is at normal the private wiper is attached to its upper terminal, but when the switching relay is energized the private wiper is shifted to its lower terminal. The reason for this change will be explained in the following paragraph.

If the first private bank contact is busy the switching relay will be shunted out, and, following the de-energization of the rotary magnet, a circuit may be traced from ground at the private bank contact, break springs relay E, break springs rotary magnet, off normal springs, relay X, to negative battery. The private control relay will energize and close the circuit of the rotary magnet; the rotary magnet, in turn, will energize and advance the shaft and wipers one step, at the same time opening the circuit of relay X. Thus it will be seen that the switching relay will remain shunted out so long as the private wiper engages busy private bank contacts. The rotary magnet and the relay X will continue to operate alternately, and as a result the shaft and wipers will be advanced step by step until such time as an idle trunk is reached. After the call has been extended to the connector the release trunk ground must not again shunt out the relay E, therefore the private wiper is shifted from one terminal of relay E to the other.

Quetions

A. What would happen if relay X energized in series with relay E?
B. If, in Fig. 24, there were a short between the upper pair of make springs on relay E, what would result?
C. What would be the result of an "open" in the break springs of relay E?
D. Primarily what is the function of the springs on the rotary magnet?
E. Are the rotary magnet springs needed after the first rotary step is accomplished?

(To be continued)

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United States Navy's Communication Systems in France

By Samuel W. Beach, U. S. N.,
Washington, D. C.

Telegraph and Telephone

Throughout the period of activities in France during the Great War the army and navy maintained their own separate and distinct paths of communication as far as possible, the two systems meeting for the mutual exchange of business at important relay points, such as Tours, Brest, Bordeaux and St. Nazaire.

Our first long distance telegraph lines were leased from the French, including a line between London and Brest, via Havre, which came under American control in December, 1917, and managed to work fairly well under coaxing. Another leased circuit connected Brest with Nantes via the District Commander's Headquarters at Lorient, where our "Pogieboats," or mine-sweepers, were based, and the big port of St. Nazaire. This circuit was later practically paralleled by a new, American-built pole line.

The eleven United States naval air stations in France presented a more complex problem. They were widely scattered, and isolated, while telegraph and telephone connection with them was absolutely vital. As a usual thing, this was accomplished by telegraph and telephone loops to the nearest French office, where they were cut in to leased wires to the closest District Commander's Headquarters. These circuits were comparatively short, "open circuit," affairs using a small gauge overhead wire, the necessary main line battery at each station were seldom of equal strength, making adjustment difficult, and signals sluggish. The leased line between Brest and Nantes was Americanized into a closed Morse wire, which was, however, always greatly susceptible to changing weather conditions. There was one set of repeaters available for this circuit in St. Nazaire, and there should have been another set at Lorient.

As a result of a survey by the Commander, United States Naval Forces in France, in May, 1918, the following telegraph and telephone installations were planned:

For the Brest District—Private branch telephone exchanges at the Flag Office, the District Commander's Office, Aviation Headquarters, Carola Barracks, the Beachmaster's Office, the Disbursing and Transportation Office. Tie-lines between switchboards and the Army and French central. Long distance lines planned: District Commander's Office to Brest Air Station; District Commander's Office to Air Station at Guipavas; District Commander's Office to Air Station at l'Aber Vrach; District Commander's Office to Air Station at Treguier; Flag Office to Signal Station Point Mathieu; Flag Office to Signal Station Point Espagnol; Flag Office to District Commander's Office at Lorient.

For the Lorient District—Private branch exchange in District Commander's Office; private branch exchange in Port Officer's Office, St. Nazaire. Long distance lines planned: District Commander's Office to Ile Tudy Air Station; District Commander's Office to Air Station La Trinite, to St. Nazaire; St. Nazaire to Air Station, Le Croisic; St. Nazaire, through Nantes to Air Station at Fromentine, with Paimboeuf Air Station bridged in.

For the Rochefort District—Private branch exchange in District Commander's Office. Long distance lines planned: Two circuits from District Commander's Office to Royan, hence by submarine cable to Le Verdon, to Pauillac; Air Station Pauillac to Air Station Moutchic, to Air Station Gujan; Bordeaux to Lafayette High Power Radio Station at Croix d'Hins; District Commander's Office to Air Station St. Trojan.

The navy was not prepared to undertake telegraph and telephone construction work, so the army agreed to do it. The above plans were in the hands of the Signal Corps in June, 1918, but work was delayed until August because of activities in the zone of the army's advance. Before that time, however, most of the switchboards had been installed.

In August, 1918, a Signal Corps battalion began pole line construction in the vicinity of Brest, Quimper and Lorient, assisted by 200 navy aviation men, twelve motor trucks and four trailers. A similar contingent went to the region of St. Nazaire and Nantes, while a third detachment attended to the Rochefort district, and others worked south of the Gironde River, about Bordeaux and Pauillac. Between Brest and Lorient the work was especially tedious, as most of the pole holes had to be blasted out of solid rock.

So quickly did this construction advance that within comparatively no time after Armistic Day, November 11th, 1918, approximately 750 miles of pole line was being operated by the navy, good, big copper wires, simplexed for simultaneous telephony and telegraphy. The completed circuits were as follows:

Araachon to Moutchic, to Pauillac, to Rochefort, 145 miles; Pauillac to Bordeaux, 40 miles; Pauillac to Rochefort, 80 miles; St. Trojan to Rochefort, 22 miles; Fromentine to Nantes to St. Nazaire, 95 miles; Paimboeuf to above circuit, 18 miles; Le Croisic to St. Nazaire, 24 miles; Guipavas to Army Center, Brest, 8 miles; I.'Abervrach to Army Center, Brest, 30 miles; Brest Air Station to District Commander, Brest, 4 miles; Flag Office, Brest, to Point Saint Mathieu, 25 miles; Flag Office, Brest, to Point Espagnol, 6 miles; Brest to Lorient, 105 miles; Lorient to St. Nazaire, 90 miles; Ile Tudy to Civil Center, Quimper, 25 miles.

The two big repair ships, *Prometheus* and *Bridgeport,* at anchor in Brest harbor, had private telephone exchanges aboard, connected by cable to shore. At Le Verdon there was communication by submarine cable to the French station-ship, while at Port Haliguen there was telegraph and telephone connection through a cable to the United States steamer *Marietta,* stationed in historical Quiberon Bay.

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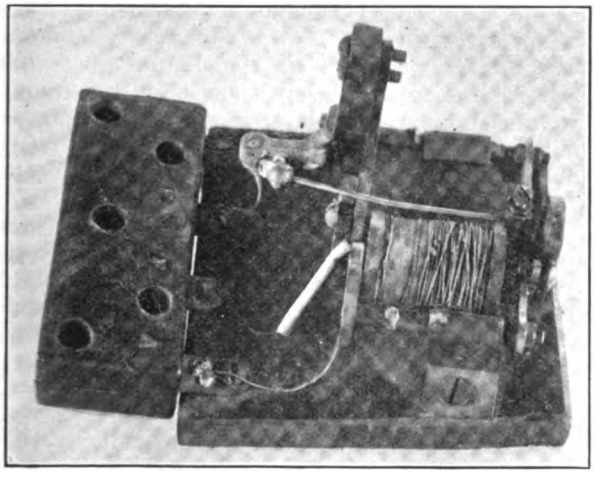
Practically the entire contemplated naval telegraph and telephone system had been completed and in operation before the armistice put a stop to activities, the one main missing link being that between Nantes and Rochefort, where the navy continued to enjoy the use of an army circuit until the last sailor boy operator flashed his "GB, 30" in France.

Our navy Morse men in France, especially early in the game, had a hard row to hoe. Fresh from America, they suddenly confronted strange apparatus, an alien language, the "Continental" alphabet when working with the French, a military discipline, no tools to speak of, and a dozen other worries, against all of which they did wonderfully well indeed.

At many of the stations, during the early months, the only receiving apparatus to be had were old tape machines. These make a sort of click that can be read after a fashion, but when a real telegraph sounder made its appearance it was prized as a great luxury. At Lorient they found a sounder somewhere, but there was no relay for it. Up bobbed a Yankee genius, F. E. Fowler, a sailor boy from Athens, Ga. He had never seen or heard of a telegraph relay, but he got a brief line on what was wanted, tore an old, broken French electric bell apart, soldered a few knicknacks here and there, and produced about the oddest thing imaginable to be called a relay. But it worked like a charm for weeks, until a better one showed up from home. Fowler's relay is in the writer's possession now. A photograph of it is printed here.



Communicating by French telephone was exasperating until the Americans assimilated enough of the language to understand "Central."

Commander Louis H. Maxfield, of the Paimboeuf Air Station (the same officer who is to pilot the dirigible balloon ZR-2 from England to America this summer) was livid with wrath one day, early in 1918, over a long distance call.

"Did you ever tackle a long distance call over here?" he asked me. "No! Well, I have. Let me tell you how it's done.

"After daintily spinning the bell knob, you carefully remove the speaking-hearing gadget from its spider-leg forks, untwisting some fathoms of cord from around the box and beneath your feet. You next select a comfortable chair, adjust the aforesaid gimmick to ear and—.

"'Allo,' you say, engagingly.

No reply.

"'Allo,' again. 'Captain HELL-O,' you rage.

"Continued silence brings you back to earth again. You realize that after all you haven't given the poor fellow at "central" half time enough to break away from his pretty mademoiselle out in the road, and hustle back to the telephone shack to answer your ring.

"You arise with the gadget still to your ear, and step to the window just in time to see the telephone expert hurriedly bid farewell to the French girl of his midnight dreams, turn, and shake a leg for the booth.

"'Ah,' you think, returning to your chair; 'ze battle is won,' and you winsomely shout another spasm of allos. You suddenly discover that you've been holding the wrong end of the gimmick to your ear. The chagrin is but momentary. No one saw you, anyway.

"Eureka!! A voice is heard. A soothing, tremulous voice greets you: 'Did you by any chance desire a number, sir?'

"You answer that really and truly you had thought to speak with St. Nazaire, but will gracefully withdraw and wait until tomorrow if the French lass is spending the afternoon. Thereupon you hang up, and settle back for a wait.

"After an hour or so your bell rings. A voice, copious with glee, informs you: 'I've got St. Nazaire for you—ne coupez pas, mademoiselle.'

"'Hello, St. Nazaire,' you say, and are immediately answered by a feminine voice: 'Avez vous termine'?

"You indignantly refute the accusation, whatever it was by a 'Certainly not—hello, is that St. Nazaire?'

"St. Nazaire promptly replies: 'Yes, this is St. Nazaire—ne coupez pas, mademoiselle.'

"Naturally, being thus continually addressed as mademoiselle brings about a state of parboiled ecstatics within your already turbulent soul. You neither know nor care what that 'ne coupez pas,' means. What you want is St. Nazaire, and you turn on that record and play it over and over again in every range of vocal volume from tippy pianissimos like the twitterings of a nightingale, through a wide range of crescendos, into the widest of fortissimos, while yet comes back in accents as unruffled as a parrot, that everlasting 'Ne coupez pas, mademoiselle.'

"Maybe after a while she seeks to allay your frothy wrath. 'Vous causez?' she titters.

"How silvery that voice! Maybe, maybe, 'um, yum—maybe. Well, anyway, you dart back: 'Oui, mademoiselle, do you?'

She parries the thrust and spars for an opening: 'Avez vous termine?'

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"She has asked if you are through with the line, but you don't know it. You are all flushed up by now. Sugar-coated dewdrops of exquisite rhetoric fairly slide from your eager tongue. Then, dog-gone it, just as your French lesson is the rosiest, St. Nazaire, whom you had quite forgotten, butts in and roughly inquires what you want with him.

"You sort of pull yourself together, sheepish-like, rehearse in your mind the business at hand, clear your throat, and begin: 'Je veux—'

"'Aw, cut it, cully,' that distant voice thunders brusquely, 'come out of it. I ain't been over here but four months, and I ain't forgot how to talk pure 42nd Street United States yet—see!!'

"You get as far as: 'I beg your par—' when you hear a rattle and a buzz, and St. Nazaire says quickly: 'For the love of Mike, ne coupez pas, mademoiselle!'

"You decide that 'ne coupez pas' must be some sort of popular scream, like 'good-night nurse.' Anyway, by this time the sun is setting in the West and you hang up, and walk off in disgust."

Indeed, telephone operators as well as telegraph operators had their trials when the navy first established its base in France.

The Origin of the Symbol "O.K."

Q.—Please give me full explanation of the O.K. letter used by business people mostly; where and when first started to be used?—J. P. C.

A.—There is not a great deal to be said about this, as the origin of "O.K" has never been clearly explained. As all the world knows now, the sign means "All correct." It probably originated from a humorous spelling of these words "all correct" as "oll korrect." It is now in universal use in the business world, meaning to pass, to certify, to indorse, as to "O.K." a bill, etc. When and where the "O.K." was first used, no one can say, beyond the fact that it had its origin in the United States.

The above is from a Canadian newspaper. TELEGRAPH AND TELEPHONE AGE records show that the origin of the symbol "O.K." is a subject which has often been brought up for duscussion. James D. Reid, who died in 1901, and who during his lifetime was often affectionately spoken of as the "Father of the Telegraph," having associated himself with Professor Morse in 1845, gave the following account as his understanding of the first use of these characters:

"There is a little obscurity about the first introduction into literature of the character O.K. They originated, it is believed, in the answer of a Southern postmaster to a communication from Washington to which he replied "Oll Korect," and which caused much amusement at the time, as the communication had some relation to the retention or loss of his head. This was in 1839, or early in 1840. In the Maine campaign of 1840 the Democrats of Portland arranged with the captain of the Boston steamer to place the letters 'O.K.' on the wheel house of his boat if the elections were going all right for the party, which many interpreted 'Out of Kole.'

"Its first use on a commercial telegraph line was in January, 1846, on the line of the Magnetic Telegraph Company, of which I was superintendent, and was as follows: "To prevent all doubt of the reception of messages, no message will be regarded as received by the office to which it has been transmitted until the signal O.K. has been received acknowledging its reception. The same signal was used on the Government experimental line in connection with the repetition three times of the letters i. i. i. i. i. i. O. K. The signal 'O.K.' soon became universal."

David Homer Bates

David Homer Bates, secretary of the Society of the United States Military Telegraph Corps of the Civil War, has resigned from the Willcox and Gibbs Sewing Machine Company, New York, with which he has been connected during the past twenty-two years, and will take a much needed rest.

His new address will be the Gamewell Fire Alarm Telegraph Company, of which he has been one of the vice-presidents for thirty-seven years.

On March 11th, 1859, Mr. Bates entered the telegraphic service as a messenger in the office of Andrew Carnegie in the Outer Depot, Pittsburgh. He soon learned to be an expert operator, and for many years was in the active telegraphic business; first, as manager and cipher operator in the War Department telegraph office, Washington, during the Civil War; then superintendent of the Western Union Telegraph Company at Philadelphia; later vice-president in New York. His most notable service was as president of the Baltimore & Ohio Telegraph Company, which he built up into an amazing organization, at a cost of less than five million dollars. In October, 1887, the Baltimore & Ohio Telegraph Lines were sold to the Western Union Company for eight million dollars.

Mr. Bates made two visits to Europe—in 1891 and 1905. He retains his connection as secretary of the Society of the United States Military Telegraph Corps. His home is at the Hotel Ansonia, New York City.

Marconi's Latest Work

An important high-speed wireless discovery is announced by Mr. Marconi, who has just returned to London.

Mr. Marconi states that he has been weeks testing a new method of wireless reception, developed by one of the company's engineers, which has enabled him to receive continuously from the United States, without being in any way interfered with by atmospheric disturbances, which are particularly prevalent at this time of the year.

He regards this advance as of the greatest importance, for it enables a wireless telegraph service to be conducted during the whole of the twenty-four hours and at high speed during the greater part of the time.

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Dr. John Ambrose Fleming, F.R.S.

Dr. John Ambrose Fleming, F.R.S., to whom the Albert Medal of the Royal Society of Arts has been awarded this year, has been closely associated for the last forty-two years with the practical and scientific developments of electricity in Great Britain. As far as 1879 he was the Scientific Adviser of the Edison Telephone Company, formed to begin telephone exchange working in London.

In 1882 and for twelve years after, he held a similar scientific position in connection with the Edison Electric Light Company of London, and later on with the Edison and Swan United Company and assisted the early progress of electric lighting in London. He carried out the electric lighting of one of the first ships to be so lit in the Royal Navy (an Indian troopship) when the then new illuminant was introduced in 1882, and during succeeding years assisted the London Electric Supply Corporation, the City of London Electric Lighting Company, and the Corporations of Exeter, Taunton, Plymouth, Peterborough and Douglas, Isle of Man, in an advisory capacity on electric lighting matters. When practical wireless telegraphy was initiated by Senator Marconi in 1899, he gave scientific assistance in its development and directed some of the early constructional work in connection with the first long distance wireless station at Poldhu. He invented in 1904 the first form of that remarkable appliance, the thermionic valve, or detector, which in its later improved forms, due to subsequent inventors, has effected such a revolution in wireless telegraphy and telephony, and has given many inventions to this and other branches of electrotechnics.

On the scientific side of electrical science, he has been a prolific contributor to the transactions of various learned societies, having communicated in the last forty-eight years in all about ninety scientific memoirs to the proceedings of the Royal Society, the Physical Society, the Institution of Electrical Engineers, and the Royal Society of Arts. About twenty of these papers described important work on the electric and magnetic properties of matter at low temperatures, carried out in conjunction with Sir James Dewar at the Royal Institution of London. He read the first paper before the Physical Society of London at its inaugural meeting in March, 1874. A paper by him on "The Necessity for a Standardizing Laboratory for Electrical Instruments," read in 1885 to the Institution of Electrical Engineers was the means of bringing into existence the Board of Trade Electrical Laboratory and gave an impetus to the movement which later on resulted in the establishment of the National Physical Laboratory.

He is the author of sixteen text-books or treatises on electrical subjects which have had a world-wide circulation. The best known of these are his books, "The Principles of Electric Wave Telegraphy and Telephony," "The Alternate Current Transformer" and "The Thermionic Valve and Its Developments in Wireless Telegraphy."

For thirty-six years he has held the chair of Electrical Engineering in University College of the University of London and has also given during that time about fifty lectures before the Royal Institution of London, including eight Friday evening discourses, thirty discourses before the Royal Society of Arts, and numerous lectures to the British Association and other scientific institutions.

In addition to the Fellowship of the Royal Society in 1892, his scientific work has been recognized by the award in 1910 of the Hughes Gold Medal by the Royal Society, by The Institution Premium (twice, in 1903 and 1912) of the Institution of Electrical Engineers, by The Bernays Prize of the Society of Engineers, and by a Silver Medal from the Royal Society of Arts.

He has always taken a great interest in popular education and as a Gilchrist Lecturer for many years addressed large working class audiences in various parts of England as well as lectures on educational subjects at University College and elsewhere. He has recently completed a book entitled "Fifty Years of Electricity, the Memoirs of an Electrical Engineer," in which he has described the chief notable achievements of electrotechnics in the last half century, with many of which he has been intimately connected.

The Albert Medal was awarded to Thomas Edison in 1892 and to Dr. Alexander Graham Bell in 1902.

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First-Aid For Telephone Companies

So successful was the First-Aid Contest held by the Bell Telephone Company employees at Newark, N. J., that now First-Aid courses have been planned by the Pennsylvania Telephone Company for 6,000 employees, with contests to follow at Pittsburgh, Harrisburg and Philadelphia.

The contest in New Jersey was held at the conclusion of First-Aid courses in which more than three hundred and thirty certificates were received, whereas five hundred additional men and women who did not care to take the examination were enrolled in the classes.

So many entries were made throughout the State that it was necessary to hold elimination contests among the two hundred men who signed up. The contest itself was held at Newark, with twelve teams, each composed of five members. The winning team was presented with the Telephone Company's Division Trophy, while gold emblems were the prizes borne away by each team member.

The American Red Cross co-operated with the Bell Telephone Companies throughout the course; Dr. C. W. Berry, Director of First-Aid; Captain Mills and Captain Scully of the Water First-Aid Department, and Dr. T. W. Kilmer, all in the Atlantic Division, lectured and gave demonstrations.

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Telegraph Keyboard Perforators

By A. C. Booth

(Printed in part from the *Post Office Electrical Engineers' Journal,* London)

One of the first practical instruments of this type for Morse characters to be tried by the British Post Office was that designed by the well-known Wheatstone telegraph engineer, F. G. Creed. It was brought into use in 1900, air pressure being employed to effect the perforations. Fair results were obtained, but the keys were arranged in three curved rows which made the width of the keyboard excessive and difficult for the operators. The telegrapher did not take to it and eventually it was abandoned.

Another instrument which made its appearance a few years later, about 1905, was the Gell Keyboard Perforator for Morse working. It has been very successful, and is still in use, but generally speaking it is not in such favor among operators as the later instrument made by the Kleinschmidt Company, of America, in about the year 1911. Both these instruments have a separate key for each Morse signal.

Of the Perforators using the 5-unit code, the first is that by Carpentier, of Paris, made some time during the latter part of last century. It perforated square holes and was what is known as a double case instrument, that is to say, each key was used for two characters, one a letter, the other a figure or symbol, but in both cases the one key perforated the same holes. The difference in printing was obtained by a control key, of which there were two, one marked "Letters," the other "Figures." These keys also provided "space" signals. This code is termed for convenience the "5-unit A," to distinguish it from other arrangements of the same code.

Next on the scene came Murray with a re-arranged Baudot code, the "5-unit B," bringing the secondary symbols into line with ordinary typewriter practice. It has the great advantage of feeding forward the slip in jumps of half an inch for each letter. Later on, Murray followed the Carpentier-Baudot keyboard method in perforating across the tape. In this keyboard he still used two signals when changing from words to groups of figures and vice versa, viz., a "space" and a "change" signal.

The Western Electric Keyboard Perforator uses the "5-unit B" code, retaining the double signal for changing, but has some of its secondary characters in a different position. All keys except the space bar are confined to three rows.

The Morkrum Keyboard Perforator, made by an American firm, uses the "5-unit B" code and is similar to the Western Electric in its arrangement of keys, although it differs considerably in the mechanism employed.

The Siemens Keyboard Perforator uses the "5-unit C" code, differing in every character from either of the other two. It, however, follows the Carpentier-Baudot practice of a combined space and change signal, having two keys placed in front of the three rows of symbol keys. The letters and figures occupy standard typewriter positions, but the other two rows of secondaries occupy different positions to those in any other keyboard; the paper tape is also much wider.

From the operator's standpoint the Booth-Willmot device brings into line all types of keyboard perforators, whether they be used for Morse, Continental Baudot, Booth-Baudot, Duplex, Murray or Western Electric Duplex Multiplex, or Siemens Automatic systems.

The mechanism and perforated tape used by the Morse and the 5-unit codes of course differ radically, but identical paper tapes could be used by the 5-unit code instruments, and no doubt in time the various Telegraph Administrations will agree to a common allocation of signals for all letters, figures, and operating keys, leaving only a few special signals for exceptional characters used by different countries.

There is no reason why the Siemens perforator should not use the narrower slip with one row of progression holes. The adoption of this would, of course, mean some modification of the transmitters, but the cost would soon be saved by the lower cost of paper tape.

The Postmaster-General has granted permission for the Booth-Willmot device to be patented.

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Engineers' Employment Bureau

The wide and varied field of electrical engineering activity has created the need of some great clearing house of engineering services, from which engineers of any specific qualifications may be obtained.

In recognition of this want, the Federated American Engineering Societies, representing a combined membership of about 50,000, including the best and most representative professional engineers in the United States, has established at 29 West 39th Street, New York, an employment bureau for engineers of every variety of training and experience.

Applicants must be members and submit a complete educational and professional record, which is carefully classified, so that as the special requirements of any position are received, the records of men of suitable qualifications are submitted for consideration. The relatively large number of men with whom the Bureau is in touch, the comprehensive classification of records, and the fact that the services of the Bureau are free to employer and member alike, renders possible the selection of the right man for the service required. Negotiations may be confidential if desired.

The high standards required for membership in any of the member societies insure the quality of men available, and the Bureau will welcome inquiries from those seeking to build up or expand their engineering organizations in preparation for the increased activity now manifest.

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The View From the Top of 195 Broadway

Looking north, to the limit of vision, from the roof of the Telephone and Telegraph Building, 195 Broadway, New York, twenty-seven stories high, on a clear day, the great cliffs known as the Palisades, dim in the distance, stand out boldly as the western guardians where the silver thread of the Hudson loses itself behind them. Further east, the low-lying hills of Long Island are visible in the extreme distance. To the west, and closer, the Palisades resolve themselves into rugged cliffs topped by green foliage, through which, here and there, white buildings are seen and as the eye travels toward the south, a wonderful panorama unfolds —Hoboken, with its great piers where the big German liners used to dock before the war; Jersey City, with its great railroad terminal, shrouded in the smoke of many great industries, through which, at intervals, low, wooded hills may be dimly seen in the distance.

The great river, known at this point as the North River, broadens into an estuary, and is dotted with bustling tugs, canal boats, ferries, and ocean liners, inward and outward bound. Further south, the great industrial section of New Jersey spreads out —Perth Amboy, with belching black smoke, and Black Tom, where the great explosion occurred in 1916.

Two objects of interest that attract the eye at this point are the Statue of Liberty on Bedloe's Island, and Ellis Island, with its imposing group of immigration buildings.

Looking south from the easterly corner of the building, the observer has an unobstructed view down the narrow canyon of lower Broadway, to the historic Bowling Green, and sees the gray granite facade of the custom house with its wonderfully sculptured, historic figures of heroic size, and gets a glimpse of Battery Park, where, in Colonial days, the early American patriots set up the Liberty Pole, which was the object of many attacks by the British soldiers from the nearby fort. Beyond, one gets a glimpse of the ship channel, dotted with many tramp steamers lying at anchor. Further away, the picturesque, wooded hills of Staten Island rise toward the Narrows, where, hidden from sight, is New York's most powerful inner line of defense, Fort Wadsworth. On a specially clear day, hazy and blue in the distance, may be seen the heights on Sandy Hook, where are located the city's outer defenses. On the stretch of Broadway which provides the observer with his wonderful vista, are located some of New York's greatest commercial buildings; the Singer, the Equitable, the City Investing, the Adams Express and the most recent addition to the downtown skyscrapers, the Cunard, and many others. Here, too, facing Wall Street, but out of sight from the Telephone and Telegraph Building, is historic Trinity and its graveyard with its illustrious dead.

The northern prospect is dominated by two remarkable buildings, on the west the lofty Woolworth Building, and across City Hall Park, with its bright greenery, is the Municipal Building, another model of symmetry of the so-called skyscraper order. In and adjacent to the park a group of public buildings form Manhattan's only civic center—the old City Hall, built in 1803; the County Courthouse, monument to the malodorous regime of "Boss" Tweed; the Probate Court Building, the Hall of Records, and the old Postoffice. Looking down Park Row, one sees the Brooklyn Bridge terminal of the Brooklyn Rapid Transit Company and the terminal of the Second and Third Avenue elevated, and may watch the elevated trains glide to and fro, looking like children's toys. Looking east we see three great majestic arches spanning the East River and dwarfing everything in their vicinity by their immense proportions. They are the old Brooklyn Bridge, the Manhattan Bridge, and the Williamsburg Bridge, each a triumph of engineering, linking the island of Manhattan to the great city of Brooklyn just across the river.

Looking north again, to the left of the Woolworth Building, and in the middle distance, stands a building perhaps the most conspicuous of all, because it towers far above all other buildings in its vicinity; it is the telephone building, known as the Walker-Lispenard, where is located the largest long distance central office in the Bell system, as well as the New York main office of the Western Union Telegraph Company. Further north, is seen the graceful tower of the Metropolitan Life Insurance Company building, modeled after the famous Campanile, and still further north, the *Times* Building at Broadway and Forty-second Street is easily recognized. Beyond and to the west, where groups of massive buildings crown the rising heights and blend in the distance, are Riverside Drive, Columbia University, and the historic Washington Heights.

On a clear day, an unobstructed view may be obtained for twenty miles around, over the great city, its myriad buildings blended into a wonderful mosaic of pastel shades, over which the cloud-shadows play, across silver shimmering streams, which bear the commerce of the world, to the green hills beyond—a sight too impressive to be forgotten, and which can be duplicated nowhere on earth.

German Radio Developments

One of the minor results of the war has been that the German telegraphic lines are either in a bad state of repair or completely out of service. In consequence of this and of the growing commercial demands, the Telegraph Department have erected a considerable number of medium power radio stations designed to replace in part the imperfections of the wire telegraph system. At the present time these stations are handling considerable traffic. Several of them operate on continuous waves using valve oscillation generators working on wave lengths between 900 and 2,500 metres.

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The Evolution of Signs, Signals and Signalling

The *St. Martins LeGrand,* London, for July, prints the concluding portion of an article, written by J. J. Tyrrell, which in a small measure pictures the life of the average inventor of printing telegraph systems. It reads as follows:

While the five unit code was winning its way in connection with machine telegraphy, and while the struggle between automatic and multiplex was rising to its keenest point, other contests between inventors who stood for various mechanical ideas were taking place. There were, for example, the various devices for obtaining, direct from the telegraph wire, the printed telegram. Should it be by means of a type wheel or by means of a type-bar as in a typewriter? Should the printed impression be on a narrow paper tape subsequently to be gummed on an ordinary telegraph form, or should it be in the form of direct page-printing?

These principles settled in the minds of the inventors and, let us suppose, printing on paper tape by means of a type-wheel having been selected, the next point to decide upon—some inventors went one way and some went another—was, "should the type-wheel be made to strike the paper or should the paper be devised to strike the type-wheel? Further, if the paper was to move to the type-wheel for the purpose of printing, should it make the impression by the "rolling movement" or the "flying print"? Were the printing mechanisms to take page-printing typewriter form then followed the complications of the page-up with the added necessity of printing from the left of the page at the end of each line. Should this return be by carriage-return or by basket-return? Both were possible and have today their respective sponsors. In the type-wheel form of printing again, came the query as to the mechanism for the figure shift and letter shift. Should the type-wheel be embossed with the whole of the alphabet *followed* by the figures and necessary punctuation signs in sequence, separate combinations of electrical signals being fixed for each letter or sign? or should one combination be made to perform the printing of a single letter plus an alternative figure or punctuation mark, the change over from one to the other being accomplished by means of two separate electrical combinations and corresponding mechanism? If the latter, how shall the figure and letter shifts act? Should the shift-lever simply alter the relative positions of the periphery of the type-wheel with regard to the paper tape, as in the Hughes or Baudot, or should the type-wheel axle, itself provided with two embossed wheels (one embossed with letters and the other with figures), be made to move backwards or forwards, alternately placing the letter or figure wheel into service, as in the Siemens system?

What strikes one most amazingly in studying these developments is the infinite pains, patience and ingenuity which have been exercised by the many inventors in endeavoring to reach the goal of a perfect system. Something more than mere monetary advantage must have moved these men to spend themselves so lavishly upon an idea. Baudot, Creed, Gell, Highton, Hughes, Murray, Buckingham, Pierart, Harrison, naming but a few honorable names at random of those who have been closely connected with the development of printing telegraphs, are they not really of those who have seen visions and dreamed dreams and by their faith have removed mountains of difficulties?

As one studies the designs of others, too, whose models and plans lie in the museums and patent offices of the world, but whose work never came to full fruition during their own lifetime, there is something of pathos in the sight of their unfinished schemes. Nevertheless, they, too, not infrequently builder better than they knew. These were surely not less worthy for having *attempted!* Such were the thoughts of the writer as he stood in front of the original model of Cowper's Writing Telegraph in South Kensington Technological Museum, and compared it with the actual Telewriters at present in use in the Central Telegraph Office, London, today. All that Cowper seems to have lacked was a higher grade of tool and machine for the *manufacture* of his well *designed* apparatus. The idea was there.

Thus may we trace from earliest times how Man conveyed by shake of spear or brandished stony-headed axe the sense of hate, or with prostrate body the sense of submission and reverence; on till he stabilized guttural and labial sounds into speech, yet another symbol or sign of thought; on again till with cuneiform shape he left some crude symbol of his thought in more solid form, on till through aeons he lived in a world of signs and symbols, of thoughts half utter and only half understood, seeing not the things that *are*, but the shadows, the half suggestion, the hint, the misty outline. With thin fine threads of metal he one day girdled the earth: yet again, by means of signs and symbols, he flings his thoughts under the ocean till they emerge beneath the Southern Cross. Yet another step and, having flung the trammels of the metal thread behind him, he aspires to throw his own voice, fully a thousand-fold magnified, across the seas. Signs, signals all, but abandoned he stands on the threshold of an epoch wherein—who can say if thought itself may not leap out from man to man, and discarding the symbols, even of speech itself, know even as he is known?

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F. C. Lacey, of Asbury Park, N. J., formerly a well-known manager of telegraph offices in the Middle Western States, in renewing his subscription for another year, writes: "The Age cannot wither nor custom stale the popularity of it with me. I have read it since it was established, and although I am out of the old business, I find that I need the Age and enjoy it just as of old."

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY.

By Louis Casper

Lesson 33

In Lesson 32 some of the effects of electromagnetic and electrostatic induction upon parallel conductors were discussed. Before proceeding further it would be desirable to describe the effect of an electric charge upon a telegraph or similar line.

The quantity of electricity or the charge upon a disconnected or "open" conductor is equal to the product of its capacity and the e. m. f. applied to it. If we, therefore, extend a horizontal line A parallel to the open conductor L (see Fig. 91) and call the length of such a line the capacity of the conductor, and then draw a vertical line B to represent the e. m. f., the quantity C of the charge will be represented by the area of the rectangle contained by the lines as shown in the figure. Moreover, the direction of the charge, positive or negative, may be shown by drawing the rectangle above or below the line L to represent the polarity of the charge, either positive or negative as the case may be.

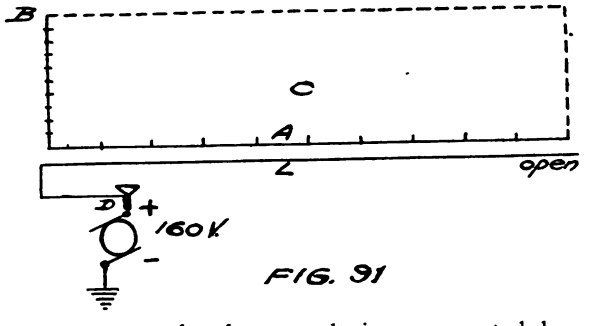

FIG. 91

If an e. m. f. of one volt is represented by a tenth of the height of the vertical line B, and the quantity of one farad shown by one-tenth of the distance of the horizontal line B, then enclosing these two dimensions into the form of a rectangle would represent one coulomb in the area thus outlined. In this way values of e. m. f. and capacity could very readily be plotted and the enclosed space represented by a rectangle would indicate the value of the charge in coulombs.

In this instance, it is only desired to show the relative magnitudes and distribution of charges in their relations to electrostatic induction.

A further discussion of this phenomena will be made in a subsequent lesson in which the quantity of electricity or the charge upon a duplexed telegraph circuit will be exemplified.

In the present case, however, it is only desired to show the relative magnitudes and distribution of charges.

The charge due to an e. m. f. of 160 volts applied to a circuit, we will say 5 m. f. capacity, is shown in Fig. 91. The area of the enclosed rectangle C represents the value of the charge, and as it is shown above the line the sign is positive. Since the wire is disconnected or "open," there is no drop of potential at any portion of the line, the same difference of potential existing between line and earth at both ends of the circuit. The charge is due to a current flowing from the positive pole of the battery to that portion of the dielectric in contact with the line, and from the dielectric in contact with the earth back to the negative pole of the battery. If the battery be now disconnected at D and the wire at the distant end earthed, the charge will flow out of the wire to earth, thus relieving the strain upon the dielectric medium, which in this case is the air surrounding the line. (See Lesson 28.)

We will now suppose that an e. m. f. of 160 volts is applied to the line L in a reversed direction, which is grounded at its farthest end, as shown in Fig. 92. At the battery end the difference of potential between the line L at B and the earth is 160 volts, but at the distant end it is zero, since at that point the wire is grounded. The charge is, therefore, represented in value by the area, and in the sign by the downward position of the triangle. It will be seen that, with the same e. m. f. applied in both cases, the value of the charge upon a grounded circuit is half approximately of that upon

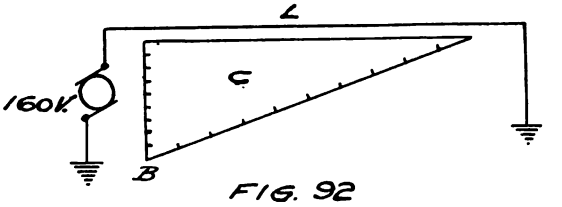

FIG. 92

the circuit when disconnected. It will also be noted that the charge is not evenly distributed over the wire, but is densest at the battery end and at the distant end it is nothing. The density of the charge, therefore, varies from zero at the grounded terminal to a maximum at the battery end, from the fact that the difference of potential of the actual line current flow similarly varies from zero to 160 volts negative.

Now, having briefly described the effect of a charge on an "open" as well as a "closed" line, we will now ascertain further the effect of similar charges upon neighboring or parallel wires following on the lines laid out by the preceding lesson.

It has been previously stated when an alternating current traverses a conductor it is given a capacity or static charge of alternately opposite sign.

Let us assume that it is first charged positively. Then displacement currents are produced from neighboring conductors into the dielectric surrounding the charged conductor, resulting in a negative charge on the neighboring conductors. When the next reversal of current occurs, the negative charge in the surrounding conductors is reversed also, since such reversal of charges on surrounding conductors is caused by the current flow in the charged conductors twice in each cycle of alternations, and which produces waves of induction upon the neighboring lines.

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In the case of wires affected by electrostatic induction it has been found that there is what is known as a *neutral point* at the centre of the wire thus influenced, at which place there is no induction, while at the terminals of such lines marked inductive effects are noticeable.

In Fig. 93, L, L' are well insulated parallel wires. L is open at one end and connected to ground at the other end through a pole changer and a generator of either positive or negative polarity. This pole changer is set into motion either by hand or by automatic means. At the center of the line L' we have the Relay R and at the extreme ends the Relays R' and R², respectively. With the pole-changer in operation we find the relays R' and R² responsive, but the middle relay R is silent. A study of the changes of potential produced in the wire L by the pole-changer will give us an explanation of this phenomenon. The wire L being open at o would be at the same potential throughout, similar to the charge shown in Fig. 91. It is

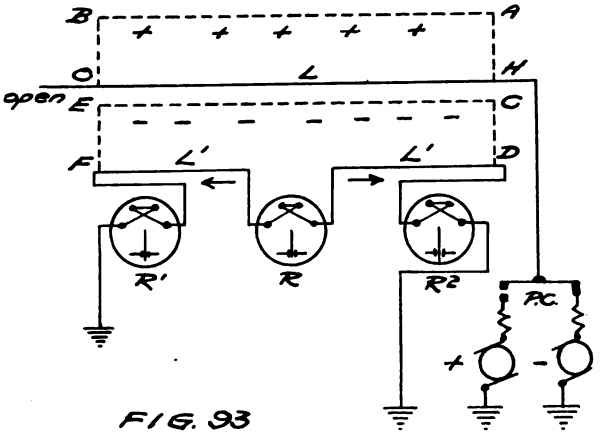

FIG. 93

assumed that at a given instant the height of potential at H would be represented by the dotted line AH; then the potential at o would be represented by the dotted line OB, and the total charge on HA would be indicated by the rectangle BOAH, assuming that this charge is of the positive sign. The creation of this charge on HA induces a charge of this opposite sign on the line L', which would be indicated by the rectangle CDEF.

Should the potential on line L become zero while the pole-changer is suspended from either battery potential for an instant of time, then the whole charge on line L goes to ground at the battery terminal the instant the opportunity is afforded, but the induced charge on line L' has two paths to the earth—one at D and one at F. This results in a current flow in two opposite directions as shown by the arrow, one current flowing to earth through relay R' and the other through relay R². This has the effect of energizing relays R' and R² for the moment while the relay R is silent. Changing the potential again by a movement of the pole-changer, another current is set up, but in the opposite direction of that just described, energizing the relays R' and R² once more, but the relay R is again silent as in the previous operation. Inasmuch as the line L is open at the distant terminal and therefore has practically an infinite resistance, it can safely be assumed that this phenomena is the result of electrostatic induction.

The effects of purely electromagnetic induction is shown by reference to Fig. 94, in which L is a grounded line at both terminals. At one terminal the ground is through a pole-changer PC and a generator of either polarity as shown in the figure. The pole-changer is operated similar to that described in Fig. 93.

In series with the line L' are relays R, R' and R² in the same relative locations as in the previous drawing. With the pole-changer in operation the three relays respond most readily and the neutral point in this instance has disappeared. This is a true case of electromagnetic induction, which can further be proven by short circuiting the relay R, when the remaining two will operate more vigorously, and if we also short circuit the relay R' the magnetic pull of the armature of the remaining

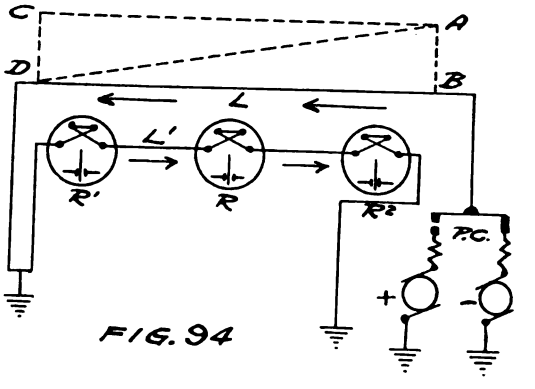

FIG. 94

relay R' is still further increased. This is in striking contrast with the arrangement as shown in Fig. 93. Had the relays R' and R been short-circuited in that case, the relay R² would fail to respond inductively to the manipulation of the pole-changer on line L.

Another indication showing that the induced current is electromagnetic by the circuit connections as shown in Fig. 93 is in the fact that if the line L' were opened at the relay R, all relays would fail to respond to the induced waves impressed upon the line L by the pole-changer.

If the line L were opened at D (Fig. 94) the potential along the line would be constant, and the charge which L would take would be represented by the rectangle ABCD, but when the line is grounded at D through a low resistance there is of course a fall of potential along the line L, and the electrostatic effect on the latter wire would be as represented by the triangle ABD, which is similar to the triangle shown in Fig. 92. In actual practice the quantity of electrostatic capacity as represented by the triangle is somewhat smaller, and of course much smaller than the rectangle ABCD, and explains the comparatively small amount of electrostatic induction between wires while such lines are grounded at their terminals.

(*To be continued*)

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Death of "Senator" Wm. L. Ives

Wm. L. Ives, aged eighty years, one of the best known figures in telegraph circles in New York City, and well known throughout the entire United States, died at the home of a relative in Syracuse, N. Y., on July 29th. During the past few years Mr. Ives had suffered several strokes of paralysis, which finally resulted in death.

Mr. Ives entered the telegraph service in Syracuse in 1857, and in 1860 he worked for the Lake Shore and Michigan Southern Railroad at several important stations. He returned to Syracuse at the end of 1861, where he took press reports for the newspapers of that city. In 1862 he entered the United States Military Telegraph service and was assigned to duty in the War Department at Washington. Later he was transferred to Alexandria, Va., where he remained until the end of the war. He returned to the Syracuse office, where he remained until 1869, when he was transferred to the New York office of the Western Union Telegraph Company. In 1872 he was appointed manager of the telegraph department in the United States Senate at Washington, which position he held for eleven years, and which fact caused him thereafter to be known as "Senator." After his retirement from the Senate he returned to the Western Union Telegraph Company's service in New York, where he remained until his retirement in 1906. Mr. Ives during national campaigns was called upon to make speeches in the interest of the Republican party. He was vice-president of the Society of the United States Military Telegraph Corps.

[The following tribute to "Senator" Ives was written by Hon. Walter C. Burton, a former State Senator and for the past seven years postmaster at Brooklyn, N. Y. Mr. Burton was associated with Mr. Ives in the Western Union Telegraph Company's service in New York for many years.]

For nearly forty years it was my pleasure and privilege to know W. L. Ives and to enjoy his friendship, and even though he tarried with us until he reached four-score years, his going brings a feeling of shock and a sense of loss.

The patriotic zeal which carried him into the ranks of that immortal body of war telegraphers remained with him through all his life. His enthusiasm for America and for the perpetuation and advancement of American ideals was always in evidence and was in a large degree the joy of his life. He was never happier than when he was expounding those ideals from the platform, which he did with an eloquence and earnestness which carried conviction to his hearers. For years he was a valued campaign orator and made many speeches for his party.

The annual meetings of the Military Telegraph Corps and the Old Time Telegraphers and Historical Association were always graced by his presence as long as his health permitted him to make the journey to the place of meeting. As a result his acquaintance with telegraphers was very large and he was well known throughout the country. His interest in everything pertaining to the telegraph was always keen and every worthy enterprise for the social or material advancement of his fellow workers enlisted his sympathy and support.

While for many years we called him "Senator" and realized that he possessed many attributes which rendered the appellation not inappropriate, those of us who knew him well and enjoyed his genial spirit and his warm friendship will always think of him as Comrade.

Dear Senator—Comrade—good-by and farewell.

Obituary

RICHARD E. MULCAHY, the Pacific Coast representative of the brokerage firm of E. F. Hutton and Company, New York, died in a hospital at San Francisco on August 8th. Although a native of Michigan, he started his business career as a messenger at Belle Plain, Iowa. He soon became an expert operator, and occupied the positions of telegrapher, train dispatcher, chief dispatcher, superintendent of telegraph, master of transportation, superintendent of construction, and general superintendent. In 1893 he entered the brokerage business in San Francisco, since which time he had been identified therewith. In 1903 he became the Pacific Coast representative of E. F. Hutton and Company, and in 1912 he was admitted to a partnership with headquarters in San Francisco. Mr. Mulcahy was an occasional visitor in New York and numbered among his acquaintances many of the most prominent telegraph people in the country.

THOMAS H. SMITH, an old time telegrapher and a member of the United States Military Telegraph Corps during the Civil War, died at Macon, Mo., recently.

DAVID E. RAND, aged eighty-three years, an old time telegrapher and a prominent official on the Boston and Maine Railroad for many years, died at Waltham, Mass., on July 3rd.

EDWIN N. ARMSTRONG, aged seventy-three years, of Peoria, Illinois, well known in telegraph circles, died at that place on July 27th.

CHARLES THOMAS BARBER, aged forty-four years, night chief operator, Canadian Pacific Telegraphs, Toronto, died on July 18th. He had been in the service of the Canadian Pacific for thirty years, having passed through the several stages of check clerk, operator, traffic chief, until his appointment as night chief operator on January 1st, 1912. He was the only son of the late A. W. Barber, who was superintendent of telegraph at Toronto for a number of years, and is survived by his wife and two married sisters.

ON August 1, the cable rate from New York City and the New England States to Germany was reduced to 30 cents per word for ordinary messages and 15 cents per word for deferred messages.

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EDITORIAL COMMENT

The Public Holding Back Their Purchases

For the past several months sentiment has been fluctuating. One moment things looked bright and cheery and the next they appeared dark and gloomy. One became either pessimistic or optimistic with the changing view. There was a certain hesitancy and uncertainty as to just what to do and how and when to do it.

As a result, business slowed up. The public stopped buying. Salesmen were called in from the road; mills and factories shut down; the ranks of the unemployed began to increase, and on all sides there was a general tightening up and a pronounced tendency to scrimp and save.

Stocks were unloaded at greatly reduced prices in an effort to stimulate buying. Extensive sales were held all over the country. Each unloading of stock brought with it another drop in price, until now, when it is generally felt that a firm level has been reached.

The public have been holding back their purchases long enough.

Institute of Radio Engineers Standardization Committee

The Standardization Committee of the Institute of Radio Engineers has been at work during the past six months preparing material for a new issue of the Institute's Book of Radio Standards. The previous edition was printed in 1915. The new book, therefore, will contain a complete revision of the definitions of radio terms and phrases currently used in the art.

About two hundred and fifty terms have been defined, the understanding of which by radio engineers and students will greatly facilitate the study of radio technical literature.

A difficulty experienced by many students is that in the many works on radio signaling, technical terms are used which are difficult to understand, and in many cases are understood only by physicists or those who possess advanced knowledge of the technique of the art of radio signaling.

The Standardization Committee for the year 1921 consists of the following members: Donald McNicol, chairman, and Messrs. E. F. W. Alexanderson, E. H. Armstrong, L. W. Austin, O. B. Blackwell, J. H. Dellinger, S. W. Eccles, E. D. Forbes, A. N. Goldsmith, C. A. Hoxie, Guy Hill, A. E. Kennelly, F. A. Kolster, J. V. L. Hogan, R. F. Gowen, H. W. Nichols, F. H. Kroger, V. Poulsen, L. W. Chubb, T. Johnson, John S. Stone, C. H. Taylor, L. E. Whittemore, Bowden Washington, A. E. Reoch, and M. B. Sleeper.

A German-English-American Patent Agreement

The following apparently inspired notice appears in the German newspapers: "Already before the war the Siemens & Halske Company had concluded an agreement with the European companies associated with the Western Electric Company regarding the exchange of patents, the object of which was to spare both parties costly legal proceedings, and to render possible to each the undisturbed extension of its special system. The war rendered this agreement of no effect. Now, however, the agreement—a gratifying indication of the coming together of the interested industrial circles—has been renewed for a number of years. A similar agreement also existed between Siemens & Halske and the Automatic Electric Company of Chicago; it has now expired, and its place has been taken by an agreement with the International Automatic Telephone Company, which is connected with the Automatic Electric Company. It refers to the extension and the exchange of patents concerning the Strowger automatic telephone system."—*Electrical Review*, London.

—o—

From the remotest, most inaccessible spot on earth—the North Pole—a wireless message will be flashed to the civilized world, if the plans of Captain Roald Amundsen, discoverer of the South Pole and famous Arctic explorer, are carried out.

—o—

A Big Price Paid for a Small Ill-Gotten Gain

About June 1st G. R. Simonds, who is said to be a floating operator, defrauded two Des Moines, Ia., banks out of $100 each, by preparing bogus messages directing payment of money to him, and having them delivered to the bank. Where he obtained the received telegraph blanks the company has been unable to determine, but he made application to the chief operator at Des Moines for work, and while in the operating room tried to get away with some of the blanks bearing the printed address of the Des Moines local office. He was detected in the act, however. He bribed one of the Des Moines messengers, by paying him fifty cents, to give him one of the envelopes. The messenger was discharged at once. City Superintendent White immediately advised his superior officials and spread broadcast a suitable notice and description. As a result, Simonds was caught at Kansas City a couple of days later, when attempting to perpetrate the same scheme on Kansas City telegraph banks. Simonds was held at Kansas City until the Des Moines banks, through a detective agency, could have him brought back to Des Moines and prosecuted. Simonds was sentenced last week to a seven-year term in the Iowa State Penitentiary.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.

1205 Hobart Bldg., San Francisco, Cal.

2044 Railway Exchange Bldg., St. Louis, Missouri.

CUSHMAN ELECTRIC COMPANY, Inc.

Manufacturers of

MOTOR GENERATORS

For

TELEGRAPH, TELEPHONE AND SIGNAL SERVICE

GENERATORS, MOTORS AND DRIVES FOR SPECIAL APPLICATIONS

—o—

Our Production and Distribution will be under the expert supervision of Mr. Alexander P. Achimore (Formerly Power Engineer Western Union Telegraph Co.)

—o—

General Offices and Factory,

CONCORD, N. H.

HALL SWITCH & SIGNAL CO.

Garwood, N. J. Chicago

MANUFACTURERS OF THE

GILL SELECTOR

THE UNIVERSAL SELECTOR

FOR

TELEGRAPH AND TELEPHONE

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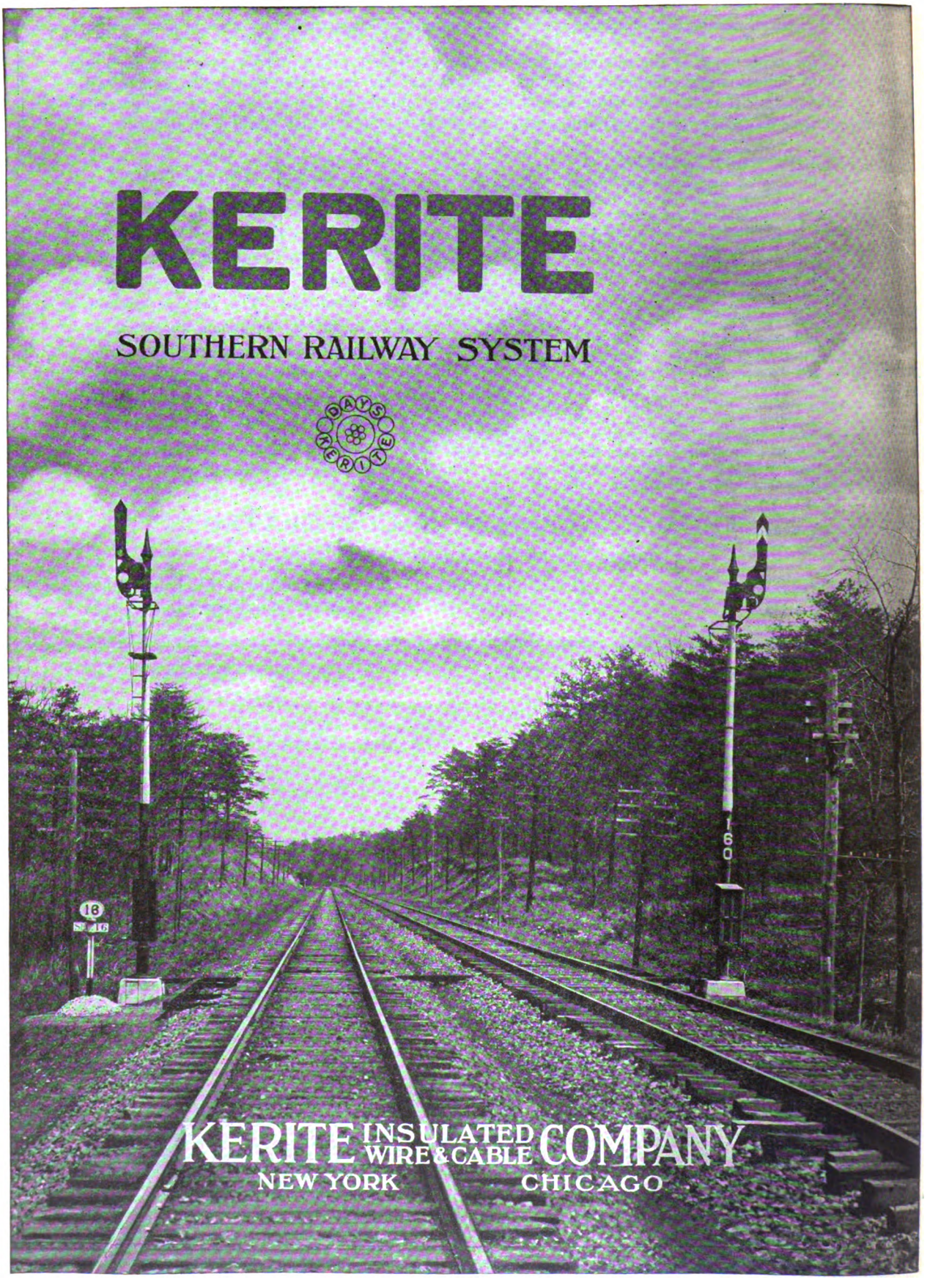

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THE RAILROAD

Is the Telegraph and Telephone Section of the American Railway Association of Value to Telegraph Department Men?

By H. HULATT, Manager of Telegraphs, Grand Trunk Railway System, Montreal.

(*Chairman of Telegraph and Telephone Section*)

On September 21st, 22nd and 23rd, at Cleveland, the third annual meeting of the Telegraph and Telephone Section is to be held, and it is hoped there will be a very large attendance of representatives of members at such meetings.

The primary object of the Telegraph and Telephone Section is to co-ordinate and concentrate through a central source, the brains and experience of the telegraph men of all railroads operating in the United States, Canada and Mexico, so that such railroads may benefit from an efficiency point of view. It is simply a larger development of the old theory that "Two heads are better than one," which, in practice, has proved to be true over and over again.

The work of the section is undertaken by numerous committees, many of which are divided up into sub-committees. The personnel in all cases being carefully selected, so that experts in the different phases of the work bring all their special experience to bear upon specific set problems in order to elaborate recommended practices or furnish information which will be of value to all railway telegraph departments.

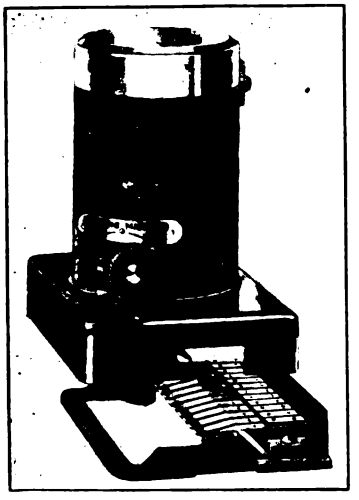
The section, however, is run on democratic lines, consequently, at the annual meetings the representatives of members are afforded an opportunity of discussing the reports of the various committees, and if, in the opinion of the section, desirable, can suggest or make amendments or additions thereto.

While the Committees' reports are always extremely instructive, there is, undoubtedly, a great educational value in the discussions. Having this in mind, it is essential that all attending the section's meeting should be prepared to enter into the various discussions in connection with the individual reports.

To enable this to be done intelligently, all Committees' reports are distributed some considerable time before the meeting in order that they may be studied.

A perusal of the printed proceedings, giving verbatim reports of the discussions at the previous meetings of the section, indicate that such discussions are taken part in by relatively a few of those attending, and usually, by the same men. This is a defect in the interests of all concerned which it is desirable to remedy. The discussions should be entered into by a far greater proportion of the members attending. There are, often, many men with wide experience who sit still and say nothing, claiming they are not accustomed to public speaking. The section is not looking for orators, but does desire that it shall receive the benefit of the brains of as many men as possible, and it is to be hoped at the coming meeting that there will be a large number of men who have heretofore kept silent, who will take their proper place and enter into the discussions.

We, in the telegraph profession, are living in strenuous days; conditions are changing almost overnight. Not so many years ago a railway superintendent of telegraphs, who could use the Morse code, had a knowledge of wire testing, understood the proper care of gravity batteries, how to set up a duplex or quad, coupled with a rough and ready knowledge of constructing matters, to use a common expression, "Filled the bill." Today superintendents of telegraphs must be able to intelligently and efficiently handle simplexes, private long distance telephone circuits, phantoming of circuits, installation and care of printer telegraphs, telauto-



HAVE YOU EVER THOUGHT

how nice it would be to have a slip base relay so that when your Chicago duplex is tied up because the relay contacts are worn down you can swap it out in one minute.

We've thought of it a lot and here's the relay.

The price is reasonable and we'll send you one for examination if you wish.

MORKRUM COMPANY

1410 Wrightwood Avenue

CHICAGO

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graphs, and other types of electrical and mechanical labor and time-saving devices. They must also have some knowledge of wireless telegraphy and telephony, inductive interference, and maybe, before very long, a knowledge of the "Wireless Carrier System," and other complex electrical problems, etc. They must also be posted on all the modern methods of handling traffic, economy in the use of wire facilities, etc.

It can plainly be seen, therefore, that our profession has entered into what may be termed the higher technical field, and the necessity is present for us all, whether we be officers or privates, to endeavor to equip ourselves mentally for the much greater problems and responsibilities we shall undoubtedly be callled upon to study and assume in the coming years. Personally, I know of no better means of assisting us to attain a wider knowledge of our business than by a careful study of the reports of the Telegraph and Telephone Section and of the discussions which take place at the meetings.

There are many men on the "firing line" out on the road, who do not have an opportunity of attending committee meetings or section meetings, and yet who, based on their practical experience, very often have extremely valuable suggestions. The section should be given the benefit of the experience of these men, and I know of no better way than for the senior representatives of the different railroads to forward the reports of the committees to such men for their perusal, study and suggestions, and if the men make suggestions deemed worthy of forwardance to the chairman of the committee interested, such should be done and the men making the suggestions notified that such course of action has been followed.

The railroads are at an expense in maintaining the Telegraph and Telephone Section, but as a result of my observation, I believe they receive big returns on their investment.

If all co-operate to give the section the benefit of their brains, such return on investment would undoubtedly be tremendously increased.

Not only the status the telegraph department occupies in a railroad, but also the status the section occupies in the American Railway Association, is and always will be, governed in accordance with the well-known dictum, "By their works ye shall know them."

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HENRY C. SPRAGUE, aged seventy-six years, formerly and for many years superintendent of telegraph of the Kansas City, Fort Scott and Memphis Railroad Company, with headquarters at Kansas City, Mo., died on July 24th at his home in that city. Mr. Sprague retired from the superintendency when the railroad with which he was identified was absorbed by the St. Louis and San Francisco Railroad Company some years ago.

Alexander P. Achimore to Enter Business Field

Alexander P. Achimore, who has been connected with the engineering department of the Western Union Telegraph Company, New York, for several years as power engineer, is leaving the telegraph service to engage in the manufacture of motors and generators.

Mr. Achimore will be associated with the Cushman Electric Company of Concord, New Hampshire, as treasurer and manager, and will have entire charge of production and distribution. His many years of experience with motors and generators, and his knowledge of their various applications, will prove of great value in his future life of endeavor.

It is needless to say that Mr. Achimore's old telegraph associates wish him every success in his new work.

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THE Schaper Construction Material Company, with offices at 90 West Street, New York, whose advertisement appears on the back cover, is the oldest telegraph and telephone material supply company in America. Among the articles manufactured by this company are all classes of pole line construction material, including special clamps come-alongs, etc. The officials of this company are well known to the electrical trade. John S. Schaper is president of the company and A. R. Ermisch is secretary and treasurer. Associated with these gentlemen is Harry G. Madden, well known in the trade. All three of these gentlemen have devoted their entire life to this business. Mr. Madden devotes his entire time visiting telegraph and telephone interests and meets every requirement of the service. His amiable and jolly disposition makes him a most welcome guest everywhere.

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Vitrohm Resistor Units

The Ward Leonard Electric Company, Mount Vernon, N. Y., has just issued a booklet descriptive of the Vitrohm (Vitreous Enamelled) Resistor Units, which is of great value to those using this class of goods. We would recommnd those interested sending for a copy of the booklet.

Telegraph and Telephone Life Insurance Ass'n

Assessment Nos. 703 and 704 have been levied by the Telegraph and Telephone Life Insurance Association, New York, to meet the claims arising from the deaths of: Cloyes M. Frost, Buffalo, N. Y.; Robert McCarthy, Philadelphia, Pa.; Charles E. Smith, Boston, Mass.; Alvin T. Gould, Indianapolis, Ind.; A. John Holland, Oil City, Pa.; Elmer H. Locke, Philadelphia, Pa.; Isaac Smith, Newark, N. J., and James D. McDonald, Boston, Mass.

———o———

A WITNESS to the recent sending of Colonel Clowry at New York to Colonel Newton at Little Rock, Ark., writes us that the Morse of Colonel Clowry reached Little Rock as clear as a tinkling bell and was sweet music to telegraphers in these days of bug sending.

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ACCORDING to one of the technical journals, we are informed that what is stated to be the largest submarine cable in the world was laid July 12th in the bed of the Detroit River, between Detroit and Windsor. It was 10½ inches in diameter. Think of it, 10½ inches! We wonder who measured it.

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New Western Union Office at Memphis

By W. V. McGuinness

"Distinctly Western Union." This phrase sums up in a few words the impression one receives of the new Western Union main office at Memphis, Tennessee. Externally, the three-foot by twenty-five foot Flexlume sign imbedded in the parapet on both the Monroe Avenue and Second Street sides, and the usual Western Union window signs create that impression. Internally, the neat commercial office on the ground floor and the operating room on the third floor further enhance it.

In the commercial office, covering about 3,000 square feet of floor space, the manager is centrally located between a 40-foot customers' counter in front and a delivery counter in the rear. Sixteen call circuit registers and a call circuit switchboard are located on and near the rear counter.

The operating room on the third floor is laid out in a novel way, with the distributing center table in the middle, flanked on one side by four Morse operating tables, providing for eighty Morse positions, and on the other side by three multiplex operating tables providing for twenty channels. These tables are located on 10 foot 6 inch centers. On every second table is mounted a two-way table belt, the lower belt used for picking up messages and the upper belt for delivering messages. This arrangement avoids the use of overhead belts and gives a clear, unobstructed view of the office. The windows in the operating room were especially designed for this belt distributing system, the windows running from the 14-foot ceiling to a distance of 4 feet 6 inches above the floor. This arrangement will be carried out in some of the larger Western Union offices to be installed in the future.

The testing and regulating department is located in the northwest wing of the operating room. In this wing is also located the main switchboard, composed of four main line sections, one loop section and one time service section, distributing frame, motor generators, motor blowers, repeater tables, ticker apparatus and rotary repeater. To the switchboard are brought eighty-eight main line wires, fourteen city wires and ten single loops.

A 35-h.p. emergency engine located in the basement acts as a reserve to keep the office in operation regardless of breakdowns in the local power company's service.

The telephone room is partitioned off in the eastern end of the third floor and is connected to the distributing center by the belt conveyor system. It contains a five-section recording board and an 18-position operating table.

The remaining space on the third floor is taken up by the bookkeeping room and the automatic school. These will be moved when the growth of the operating room makes it necessary.

Ample rest and locker rooms for both men and women are provided on the second floor. Similar facilities for the messengers are located in the basement.

The building is 75 feet by 150 feet, and is occupied entirely by the Western Union except for a frontage of 105 feet on Monroe Avenue and business offices occupying part of the second floor. The Western Union has a thirty-year lease on the entire building, which was especially erected to suit its needs.

The Distribution of Radio Literature

Pierre Boucheron, advertising and publicity manager of the Radio Corporation of America, New York, is distributing considerable literature designed to assist users of both transocean and marine radio services. Among the literature being sent out is a booklet, "How to Send a Radiogram via RCA"; Tariff Book and Map of Marine Stations and Rates.

The booklet, "How to Send a Radiogram via RCA," tells the public who the Radio Corporation of America is and how to use any of the three communication services, namely, trans-Atlantic, trans-Pacific and Marine. A few of the leading rates of each service are given as a guide and the saving over the cables shown. The booklet, which is intended for the general public, paves the way for the more detailed and complete Tariff Book and Marine Rates.

The Tariff Book gives a list of services, rates for both trans-Atlantic and trans-Pacific services, terms and conditions under which a Radiogram is accepted and other timely information on the "radio way." This book is intended for distribution to business houses using radio service, and more particularly for the guidance of the telegraph and cable clerk.

The Map shows an outline of two marine coastal stations and their connection with the Central Radio Office at 64 Broad Street, New York. Coast station rates and the land line rates via these stations to every State in the Union are listed. Some of the most important trans-oceanic rates to Europe are also given to assist operators in routing Radiograms. This map is intended for distribution primarily to steamship companies and ship radio operators.

Additional literature in the form of booklets, rates, dodgers and other means of direct advertising are being issued from time to time in accordance with the needs of the service.

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone is now in the fourth edition. The book has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by Telegraph and Telephone Age, 253 Broadway, New York. —Advertisement.

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PERSONAL

CAPTAIN J. J. BAHNSON, general manager in China and Japan of the Great Northern Telegraph Company, with headquarters at Shanghai, passed through New York recently on his way from Europe back to China.

PAULINO SOLORVANO has been appointed director general of communications of Nicaragua with headquarters at Managua, vice T. Tijerino, appointed consul general of the Nicaraguan Government at New York.

ALFRED UMFRED, a prominent business man of Oakland and San Francisco, Cal., thirty-odd years ago a member of the telegraph profession in this city, was a recent New York visitor.

POSTAL TELEGRAPH-CABLE COMPANY

THE Commercial Pacific Cable Company has filed with the State Department an application to duplicate its present cable to Japan, provided satisfactory arrangements can be made with the Japanese government.

HORACE PLATT of Cleveland, Ohio, son of E. C. Platt, treasurer of the company, was married at Erie, Pa., on August 4th, to Miss Gretchen Durlin of Erie.

RUSSELL BRUCH, aged twenty-four years, son of Charles P. Bruch, formerly and for many years vice-president of the Postal Telegraph-Cable Company and now in the service of this company at Cleveland, Ohio, it is thought was drowned while canoeing on Long Island Sound on August 7th. Mr. Bruch left the Greenwich Inn at Sound Beach, Conn., about 7 p. m. in a canoe. He was alone and wore only a bathing suit. Since his departure nothing has been heard from him, nor has the canoe been found. Searching parties have been out on the Sound and a wireless alarm for the missing young man has been sent out, but without result. Mr. Bruch was an athletic expert in the use of the canoe and could swim well.

MISS MARY FLOOD, connected with the traffic manager's clerical force, New York, gave a birthday party at her home recently. It was attended by members of the staff of the executive and operating departments. A pleasant evening was spent, and Miss Flood was presented with many tokens from both departments.

HARRY TIER, formerly of the New York operating department, has been appointed manager of the Orange, N. J., office.

WILLIAM ANDERSON, the promising manager at 520 Hudson Street branch, New York, was married on August 14th.

CITY MANAGER JAMES J. MCDERMOTT is again back in the harness, after an absence of several weeks due to illness.

W. P. MAGUIRE has been appointed manager at Wilmington, Del., vice C. B. Young, on sick leave.

W. GOMPF has been installed as manager at Norwich, Conn., in place of J. J. Maher.

Managers Appointed

T. W. Durner, Johnstown, Pa.; W. P. Maguire, Wilmington, Del.; J. L. Blair, Washington, Ga.; Judith LaFrage, Henderson, N. C.; Miss E. M. Mullen, Greenville, N. C.; F. R. Baker, Pontiac, Mich.; I. Rubin, Suffern, N. Y.; J. F. Bowman, Joplin, Mo.; C. J. McKinney, Durant, Okla.; H. R. Cook, Easton, Pa.; Mildred E. Strout, Portsmouth, N. H.; Paul V. Clotfelter, Shawnee, Okla., and Helen M. Finn, Victor, N. Y.

MRS. E. M. THORNSBERRY, manager at Peabody, Kansas, has been transferred to the management of the Newton, Kansas, office.

J. D. PROSSER, the well known Old Timer of Jackson, Ala., has been transferred to the Jackson, Miss., office of this company.

W. J. MARTAN, manager of the Niagara Falls, N. Y., office, is in Edinburgh, Scotland, as a delegate to the International Rotary Convention.

Charles F. Bartlett, aged sixty-seven years, for twenty-five years chief operator of this company at St. Louis, Mo., died on July 27th, after an illness of six months. Mr. Bartlett was a native of Indiana, and entered the telegraph service at Frankfort, Ky., in 1865. He was manager of the Pacific and Atlantic Telegraph Office in Guthrie, Tenn., in 1867, and was with the Western Union Telegraph Company at St. Louis from 1878 to 1880. He then entered the railroad service for a brief period, returning to Atchison, Kansas, as manager of the Atlantic and Pacific Telegraph Company. In 1883 Mr. Bartlett was a member of the New York Western Union force. He held other positions with the Western Union at St. Louis until 1884, when he went with the Bankers and Merchants Telegraph Company, which was merged with the Postal Telegraph-Cable Company in 1887. He remained with the latter interests at St. Louis until the time of his death. He is survived by his wife and three sons.

IN remitting to cover his subscription for another year, A. B. Richards, general superintendent of the company at San Francisco, writes: "I hope you are happy and contented. Happiness and contentment make up for all our losses. As long as I am on this terrestrial sphere you will be ever sending forth good will and cheer to me and to the craft through the pages of the AGE, and you never have been guilty of sending forth the dangerous fumes of folly. I often think of you and the free and generous work you have done for our common cause."

E. E. BUTLER, manager, Postal Telegraph-Cable Company, Louisville, Ky., writes: "Please let me express my appreciation for the AGE. I hope it may meet with continued success. It is a valued magazine."

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WESTERN UNION TELEGRAPH CO.

VICE-PRESIDENT G. M. YORKE states that tenders are being invited from American and foreign shipbuilders to construct a 340-foot cable ship for the company. The company is planning for a Diesel-electric type of propulsion. The Diesel-electric drive is admirably suited to the needs of a cable ship.

THEODORE P. COOK, formerly and for many years general manager of this company at Chicago, is visiting in New York, the guest of Colonel Robert C. Clowry at his home in Tarrytown.

H. G. HEININGER, acting division traffic superintendent, southern division, Atlanta, Ga., has been appointed division traffic superintendent.

G. R. ALGER, chief operator, St. Louis, Mo., has been appointed acting division traffic supervisor, central division.

PAUL D. HERRON, traffic and regulation chief, St. Louis, has been advanced to the position of chief operator, vice G. R. Alger.

Eastern Division

E. P. GRIFFITH, superintendent, second district, has returned with his family from Asbury Park, N. J.

W. A. SAWYER, superintendent, first district, is spending his vacation in Connecticut.

MISS MARIE BECKWITH of the New York general operating department, is appointed manager at Monticello, N. Y.

A. W. PETERSON, formerly assistant manager at Albany, N. Y., has been appointed district commercial manager, succeeding A. R. Porte.

G. H. DAWSON, manager at Cortland, N. Y., has been temporarily transferred to Troy, N. Y.

MISS B. F. DEYOE, former manager, Brocton, N. Y., has been appointed manager at Dobbs Ferry, N. Y.

C. S. ROBB has been transferred from Malone, N. Y., to acting manager at Hoosick Falls, N. Y., during the absence of Miss C. E. Hill, who is at the Plattsburg office for the summer.

LOUIS R. PITKIN, formerly of the metropolitan district, has been appointed acting manager at Amsterdam, N. Y.

F. C. Boyd, manager at Ossining, N. Y., was transferred to the management of the summer office at Flischmans, N. Y.

A. R. PORTE, formerly superintendent of the Great North Western Telegraph Company, Ogdensburg, N. Y., and recently district commercial manager, working from Superintendent W. A. Sawyer's office, New York City, was pensioned on July 15th, having rounded out forty-five years in the combined service of the Great North Western and Western Union.

C. D. SEAMAN, manager at White Plains, N. Y., was transferred to Saratoga for the month of August, supervising the telegraph force at the Saratoga races.

A. E. MASON, assistant manager at Providence, R. I., has been transferred to New Britain, Conn., as manager.

W. C. KIRSCHBAUM has been transferred from New Britain to Waterbury, Conn., as manager.

A. A. NOURIE has been transferred from Ansonia to Norwich as manager, vice F. J. Connell, resigned.

J. T. Doran, former manager Waterbury, Conn., has been transferred to special duties in the third district.

CHARLES THOM, aged seventy-one years, a Canadian by birth, assistant repeater chief in the 24 Walker Street office, died on July 26th at his home in Nutley, N. J. He was chief in charge of the Quad Department for many years.

Boston

J. J. MULLEN, night chief operator, is confined at his home in Framingham, due to a recurrence of an old malady. His friends will be glad to hear that he is on the road to recovery.

J. F. MADIGAN, night wire chief, has returned from his vacation, which was spent renewing old friendships around Portland, Maine.

C. E. PERKINS, wire chief, is back.

WONDERFUL weather is favoring George T. Dee, who is spending his vacation touring in his car.

THE early night force held their first annual outing at Nantasket Beach on August 6th.

THE red jellyfish which visited the beach recently and poisoned many of the bathers held no terrors for the picnickers. Ted Smullen, our active night force chief, won the fat man's race. Fred Blake retained his championship "Story" belt, due principally to lack of competition.

THE swimming race between Roger Dodd and Frank Beede ended in a dead heat. These boys will have to find other means to settle their differences.

AFTER the sports the crowd enjoyed a lobster dinner at the Nantasket Hotel and then took in Paragon Park.

———o———

THIS company is establishing a new office at Knoxville, Tenn. It will be up to date in every particular. The company has sixty-five employees at this point under the able supervision of Manager Burton.

———o———

Philadelphia

JOSEPH E. JANNEY, who organized the Electrical Aid Society, and who is well known in telegraphic circles, and late manager of the Bellevue-Stratford Hotel office of Chandler Brothers and Company, is now associated with Butcher, Sherrerd and Hansell in their stock department.

FRANK KANE, of Washington recently visited Philadelphia, where he is well known to many teleg-

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raphers. Mr. Kane spent a pleasant vacation in Bermuda.

JOHN A. CHAPMAN, president of the Electrical Aid Society, has just returned from a two weeks' sojourn in Michigan. Mr. Chapman met a number of the Old Timers during his absence. The forthcoming Old Timers' meeting at Richmond, Va., was a topic of much interest.

Western Union in New Quarters at Salt Lake City

Incidental to the initial occupancy of its specially constructed and equipped quarters in the Clift Building, Salt Lake City, Utah, by the Western Union Telegraph Company, fifteen former and present officials of the company gathered from many points on July 23rd as guests of Ulysses G. Life, superintendent of the second district, at a banquet at the Hotel Utah. Many of those present were the first to "pound brass" in Utah and adjacent States, having come to the West as interpreters of the Morse code on the frontier when it was raw and untamed. Notable among these was F. D. Giles, now of Los Angeles, who came to Salt Lake in 1862 and assumed in that year the management of the first telegraph office established in the city.

All of those in attendance at the banquet spoke informally, for the most part reciting reminiscences of the primitive days, when telegraphy, like many other activities, was fraught with difficulties and inconveniences, some of which were tragic, while others were humorous.

At the conclusion of the banquet, the guests went to the new offices, where they witnessed the "cutting in" of the wires from the old quarters in the Tribune Building, this event taking place precisely at 10 o'clock, at which time the first message was ticked out.

It was an 800-word special news story to the *Tribune* from Washington, D. C. It came smoothly and without interruption, the transfer of instruments, switchboards and all other equipment having taken place without loss of time or other inconvenience, and within a few moments the flow of dispatches, east and west, north and south, across the continent, was proceeding as though there had been no complete change in the intricate masses of wires and plugs.

Superintendent Life said that the Salt Lake office is the finest and most modern in the United States. The company occupies most of the ground floor, all of the eighth floor, part of the seventh floor, and all of the basement of the Clift Building. These portions of the building were specially designed for the use of the telegraph company, which has installed all of the latest devices for the sending and receipt of messages by wire. So significant was the occasion marking the opening of the new plant that telegraph officials came from distant points to observe the "cutting in." Those who were present and who attended the banquet given by Superintendent Life were as follows:

F. D. Giles of Los Angeles, first manager for the company in Salt Lake; L. S. Wild of Butte, former manager of the Salt Lake office; W. G. Lloyd of Denver, former general manager of the mountain division; W. G. Dermody, manager of the Ogden district; C. H. Finley of Denver, traffic superintendent; R. Van Tine of Denver, auditor of the mountain division; H. E. Biggle of Denver, plant superintendent; E. E. McClintock of Denver, superintendent; H. W. Deneke, manager of the Salt Lake offices; M. H. Brown, formerly with the Western Union Company and now superintendent of the Oregon Short Line Railroad. C. J. Steinel, former company official and now superintendent of the Los Angeles and Salt Lake Railroad; H. H. Hardy, district commercial manager; A. B. Cowan of Denver, general manager of the mountain division, and S. R. Crowder, in charge of traffic in New York City. Of these fifteen men, five, Mr. Life said, had given a total of 215 years' service to the company.

All America Cables

JAMES G. MURRAY, assistant to Vice-President Davidson, is acting as staff superintendent, since the departure of W. S. Buchanan for Buenos Aires.

FRANK W. PHELAN has been appointed traffic superintendent.

FREDERICK A. PIRIE has been appointed general commercial superintendent.

E. LASSEN has taken over the duties of acting manager at Santa Elena, Ecuador, vice J. O. Wiseman, who is on furlough.

A. J. BRADY has been appoitned manager at Salina Cruz, Mexico, vice J. O. Wiseman, who is on furlough. Upon Mr. Wiseman's return, he will be technical superintendent, with headquarters at Vera Cruz.

G. WOOLLDRIDGE, who has been absent on sick leave, has resumed charge of the station at Santiago, Chile.

International Radio Telegraph Company

O. C. Roos, who has been at the Rockland, Me., laboratory carrying on investigations directed toward static reduction, has returned to New York, where he will continue his work.

CHIEF operators at the five coastal stations report that less than normal interference is now being encountered on the ship-traffic wave lengths.

GEORGE E. COLE, traffic superintendent, has returned from an inspection trip to the New London Station, WLC.

A. BARBALATE, chief operator at New London, is again in charge at that point, after an enjoyable vacation which he spent motoring through New England.

E. D. FORBES, chief engineer, has left New York for a week at Belfast and Rockland, Maine, in connection with the installation and experimental work there.

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Radio Corporation of America

TRAFFIC MANAGER W. A. WINTERBOTTOM returned from Europe on August 15th on the steamer *Berengaria* after an extended trip, during which he visited a number of high power stations on the continent. He spent several days at Towyn, the receiving station in Wales.

W. H. BARSBY, superintendent at the Belmar, N. J., station, announces the arrival of a nine-pound boy at his home.

SANNOSUKE MADA, chief engineer, and Matsuou Sayeki, radio chief engineer, of the Department of Communications, Tokyo, Japan, were recent visitors, en route to the Communications Conference at Paris. They visited the high power stations at Belmar and New Brunswick, N. J., and at Rocky Point and Riverhead, L. I., sailing on the steamer *Adriatic* August 4th. While in California they visited the stations at Bolinas and Marshall. They were accompanied by two secretaries, Alexander Nagai and C. Anazawa.

H. CHADWICK, superintendent at 64 Broad Street, New York, has returned from his vacation spent on Long Island.

THE rates to Germany were reduced from 36 cents to 25 cents per word on August 1st.

Contract for Poland Radio Consummated

Representatives of the Radio Corporation of America and of the Polish Ministry of Posts and Telegraphs on August 4th signed the final contract which will insure for Poland an international high power radio station of the most modern type.

The new radio plant will be situated near Warsaw, Poland, and it is estimated that the complete project will cost about $3,000,000. The radio system to be used is that which has been standardized by the Radio Corporation of America for transoceanic radio communication. The station will be equipped with two 200 k.w. high frequency alternators built for the Radio Corporation by the General Electric Company and the transmitting aerial wires will be approximately two miles in length, supported by ten towers, each 400 feet in height.

The first shipment of radio apparatus will leave the United States in about six months, and construction will begin immediately thereafter. It will take approximately one year to complete the station, and it is expected that commercial radio communication between Poland and the United States will commence early in 1923.

E. J. Nally, president of the Radio Corporation of America, who recently returned from Europe, where he has been investigating international radio communication facilities, stated that, although approximately ten per cent. of the Polish nationals are located in the United States, a greater percentage than any other foreign nation, Poland has never had adequate telegraph communication with North America. Heretofore, it has always been necessary to relay messages to and from America via other countries, which has subjected such communications to serious delay. However, with the opening up of the new radio station, Poland will have direct radio service with the United States of America without relay and also with other countries within its range.

The new Poland station will have a normal transmitting radius of 4,000 miles and the Radio Corporation undertakes to provide the necessary facilities in the United States for handling traffic between the United States and Poland.

Empire Radio Development

The first link in the English imperial chain of radio telegraphy is Leafield, England, to Cairo, Egypt. The Cairo station will not be ready till November, so the government proposes to utilize the Leafield station meanwhile for wireless communications to European stations and to assist in the traffic generally.

When the Cairo station is complete Leafield will be reserved for imperial chain communications.

Messages from Cairo for the Cape will be forwarded by means of stations at Nairobi and Winbuk (the ex-German station). There are to be links with the Far East by way of Poona, Singapore and Hong Kong, and Singapore will transmit to Port Darwin for Australia.

A small reserve station is contemplated at Banbury.

Messages for the chain will be received in London and transmitted to Leafield by wire or telephone.

Observations from China

R. E. DeLay, well known in telegraph circles throughout the United States, for the past two years identified with Andersen, Meyer and Company, Limited, Shanghai, China, writes as follows:

"Enclosed find remittance to cover my renewal to TELEGRAPH AND TELEPHONE AGE for another twelve months. The paper enables me to keep pace with the developments in the telegraph and telephone field in America, while living in a country which is using in every day service 'Morse Ink Writers,' similar to those used in America fifty years ago. In the personal columns of every issue I find the names of many friends and acquaintances and follow with interest the transfers, promotions and changes in the personnel of both the Western Union and Postal Companies.

"In the June 16th issue of the AGE, page 278, under 'The Telegraph and Telephone in China,' it is stated that nothing in the shape of American Telegraph and Telephone apparatus has as yet been established in China. This statement is true as far as the telegraph is concerned. However, there are thousands of American telephones in use in China and in Mukden, the capital city of Manchuria. The Kellogg Switchboard & Supply Company installed about two years ago a 3,200 Line Common Battery Exchange."

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Asylums a Necessity

To the Editor of TELEGRAPH AND TELEPHONE AGE:

Somewhere recently I read that the lunatic asylums throughout the country were overcrowded. A little later on my copy of the TELEGRAPH AND TELEPHONE AGE reached me. It is always my custom to read it from cover to cover.

After I had read the article on Automatic Telephone Practice by Harry E. Hershey and that on Student's Course in Technical Telegraphy by Louis Casper, I thought these were candidates for one of the public institutions above referred to. How these electrical experts can think out the knotty electrical problems that confront them and escape a sanatorium was beyond my comprehension.

I was so much concerned in the matter that I wrote the Editor in regard to these technical articles and the reply I received from him was that it would be necessary for me to read the articles ten or twelve times in order to secure their true value. I admit that when I read the articles six or eight times I saw the light, and I at once reached the conclusion that dull minds like mine needed the stimulus brought about by repeated readings.

Technical articles are no doubt discouraging to the average reader, but if perseverence is resorted to, success is bound to follow. I now consider myself up to date in the technical literature, and I am looking for puzzling electrical problems.

If you print this, do not disclose my name, but I realize that its publication may do someone some good. It will at least teach the younger students that there is a way to overcome electrical as well as other problems, and that way is via the route of hard work and constant digging. Yours truly,

OBSERVER.

A Birmingham, Ala., newspaper of July 24th printed the following amusing item, which will be interesting to telegraph experts:

"The Western Union here has now in its possession a new mechanical device, called the Rotary Relay. When this is connected it will place Birmingham on record as one of the main relay points acting for and with several of the largest cities in the United States. The Rotary Relay will not only perform the transmission of messages of interest to Birmingham, but it will relay messages that have traveled long distances, thereby lessening the voltage of electricity that otherwise would have to accompany the sending of any message a great distance, consequently eliminating the overloading of wires with its consequent danger to human life."

Radio Transmits Photographs Over Breadth of Ocean

Transmission of photographs and written documents in fac simile across the ocean by wireless has been accomplished. Two successful tests of this epoch-making invention have been made recently at the powerful naval radio station at Annapolis, Md., a photograph and a written message having been sent to Malmaison, the French radio station.

Two French government engineers are now in Annapolis preparing for further tests which, they believe, will prove the invention a complete success within a very short time.

The first test of the invention was the sending of a photograph of the recent Dempsey-Carpentier championship fight from the Annapolis station to France for reproduction in *Le Matin*, Paris newspaper.

While the reproduction was said to have been fairly good, it was not as perfect as the engineers wished it to be, so on August 5th another test was made.

This test was the sending of a fac simile written message from C. V. Van Anda, managing editor of the New York *Times*, to *Le Matin*, the Paris newspaper. Word came back that the message was reproduced almost perfectly.

A Sure Way to Sell Bonds

There is nothing slow about Czecho-Slovakia. The Government recently decided to improve and extend the telephone service. It issued bonds to defray the expenses and then demanded that the telephone users purchase the bonds or suffer the ignominy of having their telephone service discontinued. It is hardly necessary to add that the bonds were speedily subscribed for.

English engineers are enthusiastic over the possibility of electrification of steam railroads, and thus bring about a saving in operation in fuel alone of one-half to two-thirds. In addition to this, the repairs with electric locomotives was one-third what it is with steam. These figures are obtained from actual experiences.

Marconi International Marine

The balance sheet and report for the year ended December 31, 1920, of the Marconi International Marine, London, shows that the company's business during the past year has continued to show expansion. The gross revenue amounted to £933,567, as compared with £772,018 in the preceding year. The increase is due in substantial part to higher remuneration paid to the telegraph operators, from which the company does not derive profit.

AN old man recently came into a telegraph office to send a message to a brother notifying him that their brother John was dead. After considerable deliberation, the old fellow decided that if correct the message should come from the dead man himself. The telegram read: "Come home at once. I am dead," signing it with the dead man's name.

The First Telegraph Line in Cleveland

The records show that the Cleveland City Council in 1847 granted the Lake Erie Telegraph Company permission to erect a line of telegraph poles through the town. Regular telegraphic communication was opened in 1849.

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CONTENTS

Theory of the Secondary Line Switch. By Harry E. Hershey. (Continued from page 363, August 16th Issue) 386
German-American Communications 387
Wireless Telegraphy in France, Germany and the United States..... 388
Sells Fifteen Million Dollars Western Union Bonds. Government Control of All Wireless. Delivering Messages With Obscure or Uncertain Addresses 389
Observe Effects of Eclipse on Radio Signals. Chauffeurless Auto Now Here 390
Weather Reports. By Rear Admiral W. H. G. Bullard. Marconi International Marine Communication Company 391
Submarine Cable Tests. By J. Rymer-Jones 392
Wireless News and Propaganda 393
Pertinent Points on Government Ownership. By Edward N. Hurley, Former Chairman of the United States Shipping Board..... 394
Student's Course in Technical Telegraphy. By Louis Casper. Lesson 34 395
The Editorial—International Communications Conference. Government Views on New Pacific Cables. Suggestions Wanted for Edison Memorial. General Situation..... 398
The Railroad—Telegraph and Telephone Section of the American Railway Association 401
Annual Meeting of the Telegraph and Telephone Section of the American Railway Association. Old Time Telegraphers' and Historical Association 402
International Association of Municipal Electricians. Telephone Pioneers of America. Cable and Telegraph Concessions..... 403
Personal. Postal Telegraph-Cable Co. Russell Lowerre Bruch..... 404
Commercial Cable Company. Senator Marconi's Prediction..... 405
Western Union Telegraph Company 406
Manager's Training Office, Niles, Mich. Association of Western Union Employees. Canadian 407
Radio Corporation of America. All America Cables. Death of "Artie" McArdle. Edison One of the Best Known Men in the World. Submarine Telephony. Adverse Exchange in China..... 408

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Theory of the Secondary Line Switch

By HARRY E. HERSHEY,
Of the Automatic Electric Company, Chicago

(*Continued from page* 363, *August* 16*th issue*)

In the Automatic System which we have developed, each line terminates on a line switch, there are one hundred line switches in a group, and ten outgoing trunks from each group which lead to selectors. This is what is termed 10 per cent. trunking.

Although 10 per cent. outgoing trunking calls for 10 trunks out of every 100 line switches, the heavy probabilities against the simultaneous occurrence of peak loads in several units renders it possible access to a group of trunks terminating in secondary line switches, the secondary line switches, in turn, have access to a group of trunks leading to selector switches. The general principle of trunking between primary and secondary line switches is shown in Fig. 25. On the assumption that three indicates ten, the three groups of three circles each at A indicates a group of one hundred line switches to which the subscribers' lines are attached. The trunks from the banks of the primary line switches run to the secondary line switches as shown. The trunks from the banks of the secondary line switches lead to first selectors, of which there are ten or less for each group of secondaries, depending upon the traffic.

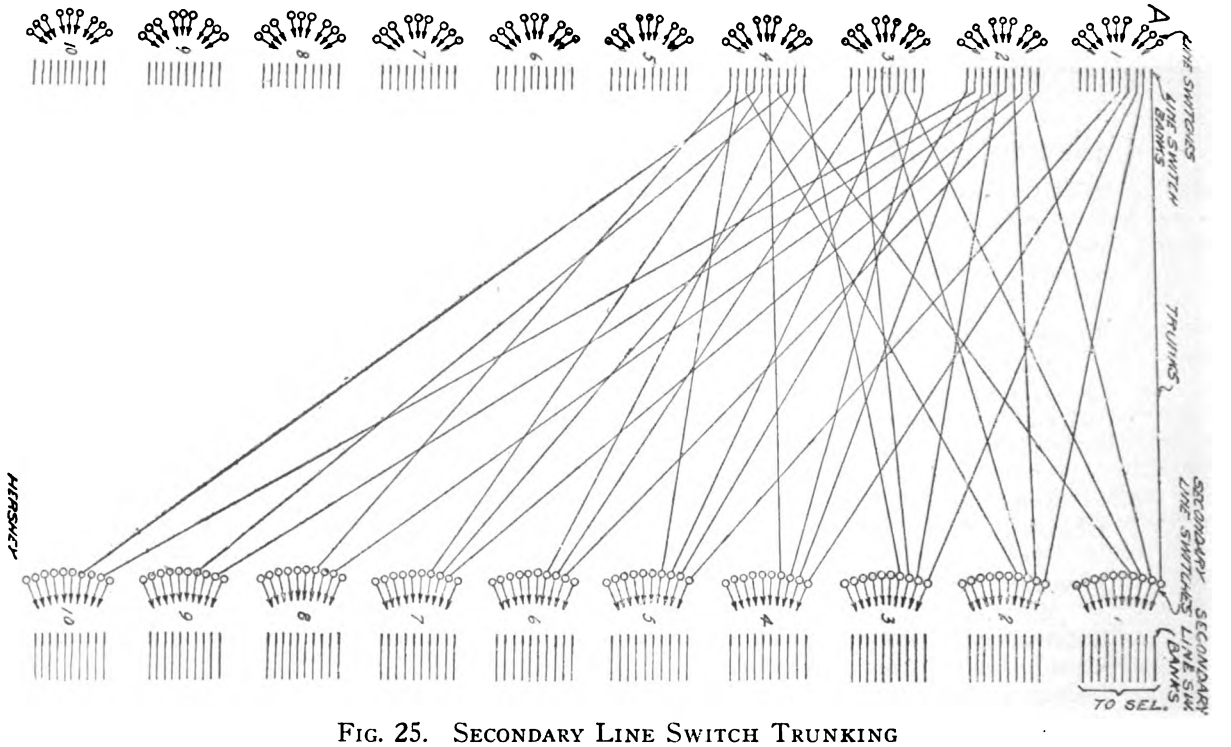

FIG. 25. SECONDARY LINE SWITCH TRUNKING

that something less than 100 selectors, let us say, might meet the outgoing traffic demands from 1,000 line switches.

It may not only occur, but certainly will occur, that the moment when some units are exceptionally busy will also be the moment when others are correspondingly idle. A proportion of the plant is likely, therefore, to be continuously idle.

The next problem to be considered is a method of giving a wider field of choice to the line switches such as would be secured, for example, if a hundred first selectors could be made accessible to every line switch in a group of 1,000. As we have seen, this is not the case in the system we have considered hitherto, but can be brought about by interposing secondary line switches between the subscriber's line switch and the selectors.

When secondary line switches are employed, the lines terminate on primary switches, which have

It will be observed that not more than one trunk from a primary group goes to a given secondary group. The first trunk from the first primary group runs to the first secondary in the first secondary group, the second trunk goes to the first secondary in the second secondary group, etc. This is the basic principle of the scheme, and upon it depends the effectiveness of the trunking. By giving each primary group a trunk into each of the ten secondary groups, all of the selectors are made available to all the subscribers. If all the outgoing trunks from a given secondary group become busy it renders useless not more than one trunk from each primary group.

CIRCUIT READING OF THE SECONDARY LINE SWITCH

In its mechanical structure the secondary line switch is very similar to the primary line switch:

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the only difference is that a projection at the rear of the plunger arm is utilized to operate a set of springs. By referring to Fig. 26 it will be seen that the secondary line switch consists of a double wound magnet. The pull down winding is 85 ohms in resistance, and is capable of operating the plunger arm. The holding winding is capable of retaining the plunger arm in an operated position and is usually wound to 1,200 ohms. The slow acting relay O is termed the open main relay and is of 10 ohms resistance.

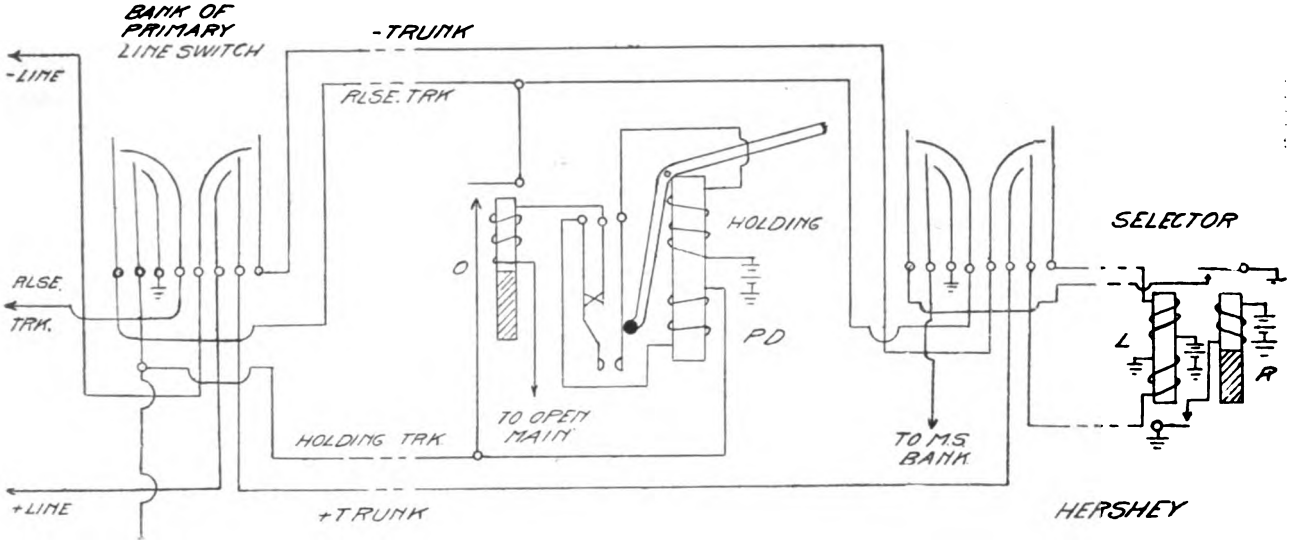

FIG. 26. SECONDARY LINE SWITCH

Let us assume that a subscriber removes his receiver, and that his line switch plunges into the bank springs shown at the left of Fig. 26. A circuit may now be traced from ground, bank springs, holding trunk, pull down winding, break springs, open main relay O, to open main (negative battery). The relay O will energize over this circuit and short the holding and release trunks; the object of this is to place ground on the release trunk so that the B. C. O. winding of the primary line switch will be energized. The pull down winding will also energize over the above traced circuit and will cause the plunger arm to enter the bank. Just as the plunger arm completes its stroke the springs will be shifted, and the holding winding will be cut in series with the pull down winding. When the plunger enters the bank the connection will be extended to the selector. The line and release relay of the selector will operate and ground will be returned on the release trunk to maintain the primary and secondary line switches in an operated position. The relay O, being a slow acting relay, will not release its armature immediately following the operation of the plunger arm, but will retain the short between the holding and release trunks until sufficient time has elapsed for the selector to return a ground on the release trunk. After the completion of the conversation the removal of the ground from the release trunk will cause the primary and secondary line switches to release.

QUESTIONS

A. Why is a holding winding provided?
B. If relay O became quick acting what would result?
C. If the springs of relay O failed to break what effect would it have upon the primary line switch?

(To be continued)

Italy—German Cables

In the event of the reported allotment of one of the German cables between America and the Azores to Italy being realized, the Italian Government intends to lay a complementary section between the Azores and Italy, and thus establish for the first time direct cable connection between Italy and the American continent. The scheme will have a further complement in that it will enable direct connection, eventually, to be made with Northern Europe. The saving upon the fees now paid to foreign cable companies for the carriage of messages will suffice to pay for the outlay on these several schemes, estimated to cost over 75,000,000 gold lire.

German-American Communications

The negotiations between the Imperial postal authorities and the representatives of the Mackay Company regarding the laying of a direct cable between Germany and the United States are still proceeding. Similar concessions are being requested by the Western Union Telegraph Company, and negotiations are also proceeding with two American companies with a view to the establishment of wireless stations in Germany.—*Reuter's Trade Service* (Berlin).

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Wireless Telegraphy in France, Germany and the United States

On July 14, in the House of Commons, London, the Postmaster General was asked if he could state what progress had been made with the wireless enterprises of the United States, Germany and France; how this progress compared with that of the British Post Office; and whether the French government had come to the conclusion that the State could not carry on the organization as well as private enterprise. In reply, the Postmaster General said:

"In all three countries wireless telegraph is being worked, as it is in the United Kingdom, partly by private and partly by government enterprise. On the whole, though the high-power stations in the countries in question are more numerous, and in some cases more powerful, than the corresponding stations in England, there is reason to think that the commercial development of wireless communication is as far advanced here as elsewhere; and the position will be still more favorable to this country when the new Post Office stations near Oxford and Cairo are working, as they soon will be; and when the further stations of the Imperial chain are erected.

"I am not aware that the French government has come to the conclusion that the State cannot carry on the organization as well as private enterprise.

United States

"In the United States the principal privately owned stations are those of the Radio Corporation of America. They are as follows: New Brunswick, N. J.; Marion, Mass.; Tuckerton, N. J.; Bolinas, San Francisco; Kahuku, Hawaii. The first three stations are used for traffic between the United States and Great Britain, Norway, Germany and France. The Bolinas and Kahuku stations deal with traffic between the United States and Japan. Most of the Radio Corporation's stations have been, or are being, equipped with 200 kw. alternators. It is claimed that the stations can work by automatic transmission up to fifty or sixty words a minute, but the stations are normally worked manually at a nominal speed not exceeding twenty to twenty-five words, and the load, sent and received, probably does not exceed 15,000 paying words per day.

"The following high-power stations are owned and worked by the United States Navy: Annapolis, Sayville, San Francisco, Honolulu, Guam, Cavite (Philippines). These stations are equipped with arc sets. The last four are used for United States Government purposes for communication. The stations are not open for general commercial work; but they are used (when not required for government purposes) for the transmission of news messages at the same charge that is made by private stations doing the same class of work. The Annapolis and Sayville stations, for instance, transmit a certain amount of press traffic to France. The service seems to be fairly satisfactory during the winter, but during the summer months it is subject to interference by atmospherics. Efforts have recently been made to receive news messages from Annapolis in this country, but the audibility of the signals is not at present sufficient to justify the institution of a regular service.

"The Radio Corporation of America have made a commencement with the erection of a new radio station on Long Island, consisting of six separate installations (one spare) grouped round a common centre, each equipped with 200 kw. alternators. They are intended for communication with various European countries.

Germany

"The principal high-power stations are those at Nauen and Eilvese, both owned by the Telefunken Company. The services with England, Italy and other European countries are carried on by the medium-power government station at Konigs-Wusterhausen, near Berlin. The Telefunken Company's station at Nauen, which is equipped with three high-frequency alternators capable of furnishing an energy of 400 kilowatts, is used for communication with the United Service. This service is not very satisfactory during the summer months owing to atmospherics; during the winter the working is reported to be fair. The amount of traffic handled averages about 10,000 words per day. It is understood that the power of the station is to be doubled in the near future, and that it is proposed to duplicate the plant.

France

"Wireless services are in operation between France and the following countries: United States, Great Britain, Spain, Hungary, Bulgaria, Roumania and Jugo-Slavia. The services with Great Britain and Spain are conducted by the Societe Francaise Radioelectrique, and the remaining services by the French telegraph administration.

"The principal stations in France are as follows: Bordeaux, Lyons, Nantes, and Eiffel Tower. The Bordeaux station is equipped with arc transmitting apparatus, the nominal power of which is 1,000 kilowatts. It is used chiefly for communication with the United States. The amount of traffic exchanged averages about 14,000 words daily, including 1,000 for the United States Navy. The Bordeaux station is also used for the transmission of traffic to Central Africa (Rufisque), Congo (Brazzaville), and Shanghai. The amount of traffic is small, about 200 words a day, and is limited to the outward direction only, reception of the messages being acknowledged by cable.

"The government services with European countries deal with a total traffic, inward and outward, of about 13,000 words a day in all. The service conducted by the Societe Francaise Radioelectrique with this country is not largely used. The traffic with Spain is not known.

"The military authorities are erecting communicating stations in the French Colonies at Bamako (Soudan), Brazzaville (Congo), Tananariva (Mad-

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agascar) and Saigon (Indo-China); but the stations are far from completion. A new central wireless station has recently been commenced at Ste. Assise, near Paris, by the Compagnie Generale de T. S. F. It will comprise two sending installations, one of which will be used for European and the other for extra-European communication."

———o———

Sells Fifteen Million Dollars Western Union Bonds

The Western Union Telegraph Company on August 10th sold an issue of $15,000,000 fifteen-year non-callable 6½ per cent. gold bonds to Kuhn, Loeb & Co., which will be offered for subscription at 99 per cent. of par and accrued interest, to yield approximately 6.60 per cent. if held to maturity.

The issue is the first of capital securities made by the corporation since 1907. The stock outstanding, on which dividends have been paid at intervals since 1874, and since 1917 at the rate of 7 per cent., amounts to $99,786,727. The funded debt of the corporation, including the present issue, amounts to $46,994,000.

The purpose of the issue is to reimburse the treasury of the Western Union for expenditures made on account of extensions, additions and improvements to its plant and equipment outside of New York and to provide funds for further extensions.

In a letter to the bankers, Newcomb Carlton, President, said that "the net income of the company, after charging taxes and before payment of interest on Western Union bonds, for the year ended December 31, 1920, amounted to $14,634,972, or about eleven times the interest for the same period, which amounted to $1,331,850. For the six months ended June 30, 1921, the net income applicable to bond interest, notwithstanding the prevailing business depression, amounted to $4,867,543, while the bond interest for the same period amounted to only $665,925. The net income of the company, applicable to interest charges, for the five years ended December 31, 1920, averaged $14,252,238, or more than ten and one-half times the interest charges during the same period.

———o———

Government Control of All Wireless

General Amado Aguirre, Minister of Communications, City of Mexico, Mexico, has just issued orders placing the wireless stations in the northern part of Lower California under the jurisdiction of the Telegraph Department.

The stations formerly controlled by the government of that territory were those established at Mexicali, Algodones, Tecate, Tijuana and Ensenada, besides the offices at Bomba, California and San Luis, Sonora.

The object of this decision is to place under the direct control of the Federal Government the majority of the wireless telegraph offices scattered throughout the Republic, besides those now operated by private parties.

Delivering Messages With Obscure or Uncertain Addresses

A. C. Cronkhite, general manager, Chicago, recently sent the following circular letter to Superintendents H. Brown, E. Boening, A. R. McGrath, A. A. Montgomery, B. J. Ross, A. A. Burr, L. R. Scholl, F. B. Travis, A. A. Brown, E. W. Grob, and C. H. Cadwallader:

"July 12th I quoted you a letter from City Superintendent Scholl reciting some good work of the Cincinnati Delivery Department in the delivery of a message with insufficient address.

"In connection with this, I quote you the following from City Superintendent Brown of Indianapolis:

" 'We received a telegram a few days ago addressed "Y. W. Casey," without a street address. The intuitiveness of Delivery Supervisor Carvin prompted him to "try" the Secretary of the Y. W. C. A. He hit the nail squarely on the head with the first blow, as the telegram was intended for the individual to whom it was delivered, although there was nothing in the text to give him a clue.'

"Also this from the manager at Saginaw to Superintendent Boening:

" 'On July 4th, while Chief Operator Bowman was looking over the telegrams on the delivery table, some of which were marked, "Left Notice," he advised the delivery clerk to open them and see what their contents were, to note if they were of an urgent nature and whether it would be advisable to service sender about leaving notice.

" 'Upon opening one telegram that notice had been left twice, the message read, "Take key to back door and leave our dog out." One of our messengers was sent out immediately with instructions to locate the addressee and if he could not locate them to give it to some neighbor and let the dog out.

" 'The messenger came back with the report that he got hold of some neighbor and located the house and a key to fit the rear door, thereby letting the dog out; party who owned the dog did not return for three days. He was very grateful to us for our efforts in making the delivery to some neighbor.

" 'Our instructions to delivery department are, "Whenever a boy brings back a telegram marked (left notice) open this telegram and see its importance, as there may be something you can do. Don't leave it lay for an hour or two, then try it again, but see it before you make the second attempt." '

"These are instances of keen and intelligent interest in the delivery service by delivery department employees and they are to be commended for it. It is this kind of work that counts. Anyone can do easy things; doing the hard things shows the kind of material in us."

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Deferred Press Service

The Colonial Office, London, announces that in order to improve Empire communication, the Pacific Cable Board is to reinstate the Deferred Press service between Britain and Canada, on the one hand, and Australasia on the other.

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Observe Effects of Eclipse on Radio Signals

An interesting description of the observed effects of an eclipse of the sun on radio communication appeared in a recent issue of "Radio Review." The description covers observations made in England and Scotland, and is as follows:

"In order to observe if any abnormal phenomena were produced during the eclipse, arrangements were made for a special watch to be kept at certain of the wireless stations under the control of the Post Office. The stations concerned were Wick, Stonehaven, Cullercoats, Caister, North Foreland, Niton, Lands End, Fishguard, Seaforth and Devizes.

"The total period of the eclipse, at Greenwich, was from 7.35 a. m. to 10.05 a. m. The maximum occurred there at 8.47 a. m. At other places the times of first and last contact and of maximum were different, but these differences were so small that as far as the observations recorded below are concerned they may be neglected.

"At most of the stations dealing with the ordinary ship-and-shore communication on 600 metres no change either in the strength of signals or in the strength or frequency of atmospherics was observed. At Fishguard (southwest coast), however, between 8.28 a. m. and 9.36 a. m., signals improved both in clearness and strength. This effect was more pronounced with the signals from distant stations than with those from nearer stations.

"At Wick (north of Scotland), although no unusual daytime ranges were observed, there was during the period of the eclipse a pronounced undercurrent of faint signals which is not normally present during the day.

"At Devizes (south of England) the conditions observed during the eclipse were practically identical with those usual during the night. With a receiver consisting of one high-frequency amplifier, a rectifying valve, and two note-magnifying valves, the average strength of signals from Warsaw during the day is 7. Warsaw works on a wavelength of 2100 metres, using spark transmission. During the eclipse, these signals increased to maximum strength, which is the usual night condition, and after the eclipse they returned to their normal daylight strength.

"Devizes also observed an increase in the strength of signals received from various French military wireless stations. These stations were working on a wavelength of about 2000 metres, using continuous waves.

"An increase in atmospherics was observed at several stations during the eclipse.

"Before the eclipse atmospherics were practically absent at all the observing stations. At Fishguard slight atmospherics were observed between 8.20 a. m. and 9.36 a. m. At Devizes atmospherics came on at the commencement of the eclipse and ceased when the eclipse was over.

"At Wick atmospherics gradually became louder and more numerous during the eclipse till at about 8.56 a. m. there was a continuous crackle. This then decreased and after the eclipse the atmospherics disappeared.

"A similar growth in the number and strength of atmospherics was observed at Caister (east of England), and there also the atmospherics disappeared after the eclipse."

Chauffeurless Auto Now Here

According to a bulletin issued by the United States Air Service, there have been radio attempts at radio control of torpedoes and battleships with more or less success, but never before has it been applied to directing the movements of automobiles.

That the new controlling system is beyond the experimental stage and is practicable is proved by reports of operations at McCook Field, Dayton, Ohio, the home of the engineering division of the United Air Service, where the invention received an exhaustive trial.

Vacuum Tubes a Live Subject

The subject of vacuum tubes is certainly a live one in these days. Inquiries for information on this subject come from all parts of the world. There are two books on the market devoted exclusively to vacuum tubes and it will be well for students and others to have copies of one or both of these valuable works.

Vacuum Tubes in Wireless Communication, by Elmer E. Bucher, price $2.25 per copy, is an elementary text book for students, operators, experimenters and engineers. It tells in understandable language the fundamental operating principle of the vacuum tube. It shows over one hundred different circuits for the practical use of the vacuum tubes as detector, radio or audio frequency amplifier, regenerative receiver, beat receiver and generator of radio frequency currents. More than one hundred diagrams reveal, step by step, in simple and direct form, the uses of the vacuum tube.

Thermionic Vacuum Tube, by Dr. H. J. Van Der Bijl, price $5.00 per copy.

The rapidly extending use of the vacuum tube as a receptor of radio waves; generator of radio oscillations; telephone repeater; alternating current rectifier, and for other purposes, has made the instrument one of the most widely discussed inventions of recent times.

Dr. Van Der Bijl, in his book, gives a thorough treatment of the entire subject of thermionics as related to vacuum tube phenomena.

The book has 282 pages and 232 illustrations.

Copies of these books or any others may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

GEORGE A. LOW, Sr., a member of the United States Military Telegraph Corps during the Civil War, now and for many years with the Postal Telegraph-Cable Company at Pittsburgh, writes: "I still retain my interest in the telegraphic fraternity and often live over in memory the stirring days of '61 to '65. I desire to express to you my appreciation of your interesting paper."

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Weather Reports

By Rear Admiral W. H. G. Bullard

An important element in safe navigation at sea is information respecting weather conditions that may be expected within a certain region in which a ship is likely to find itself. Daily weather bulletins relating to the North Atlantic Ocean, the Gulf of Mexico, the Great Lakes, and the Pacific Ocean, prepared by the United States Weather Bureau, are sent broadcast by naval radio stations as follows:

The bulletins begin with the letters U. S. W. B. for the United States Weather Bureau, and the weather conditions follow. The first three figures of the report represent the barometric pressure in inches (0.02 = 30.02); the next figure, the fourth in sequence, represents the direction of the wind to eight points of the compass: 1 = north; 2 = northeast; 3 = east; 4 = southeast; 5 = south; 6 = southwest; 7 = west; 8 = northwest; and o = calm. The fifth figure represents the force of the wind on the Beaufort Scale, running from 0 = calm, to 12 = hurricane. In order to simplify the code, no provision is made for wind force greater than 9 = strong gale, on the Beaufort Scale.

If the weather conditions from any one station cannot be supplied, the initial of the station is given, followed by the word "missing," and if any portion of a report cannot be furnished, such portion is replaced by an equivalent number of letters x.

The second part of the bulletin consists of wind and weather forecasts, and, whenever conditions warrant, information as to storm-centers, storm and hurricane warnings, and advices to shipping. The wind and weather forecasts are for 24 hours, beginning at midnight. The zones to which the forecasts apply are identified by suitable charts. Whenever a storm exists that is likely to affect a section, the location and expected direction of movement of the storm centre will be given, followed by any storm or hurricane warnings and advices to shipping that have been issued.

Example of Bulletin

(First part.) USWB J 01662 S 00663 FP 98821 ML 95427 T 95846 NY 93258 DB 92888 LB 95612 CH 94216 H 94645 AV 98282 C 96682 B 00661, etc.

(Second part.) Winds off Atlantic coast north of Sandy Hook will be shifting gales with rain. Sandy Hook to Hatteras, northwest gales with rains followed by clearing weather. Hatteras to Florida Straits, strong northwest winds; fair weather. Storm of marked intensity central off New Jersey coast moving northeastward. Storm warnings displayed Hatteras to Eastport.

The second part of the bulletin is always in plain language and requires no translation. Suitable charts show the location of many of the regular observation stations maintained by the Weather Bureau on the continent and in the Gulf of Mexico, and the Caribbean Sea, within the confines of the map; also Canadian stations. Key letters are indicated under station reports from which are given radio distribution. These reports, supplemented by others picked up from vessels, can be used, as illustrated on the chart, in the production of quite a comprehensive weather map, which will be of much value to navigating officers. Observations radiographed from vessels are in a code prepared by the Weather Bureau for "Vessel Weather Observers," and are easily translated by use of that code.

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Marconi International Marine Communication Company

Presiding over the general meeting of the Marconi International Marine Communications Company, Ltd., a few days ago, Mr. Godfrey Isaacs said that Senator Marconi was at the moment away from London engaged in some very important research work which he felt it would be inadvisable for him to leave.

The number of ships' installations increased during 1920 by approximately 12 per cent., and the revenue from ships' telegrams showed even a greater appreciation

Referring to the great improvements which had been made in wireless installations which had been fitted on ships at sea since the war, the chairman said that the range of a ship's station had been increased under normal conditions to between two and three thousand miles. Thus, a ship crossing the Atlantic was now able to keep in direct communication with one or other of the two coasts during the whole voyage.

Wireless telephony was destined to play an important part on ships at sea, and the great value of the wireless direction finder was demonstrated recently very emphatically, when the steamer *Fanad Head* was instrumental in saving the personnel of the Norwegian steamer *Ontaneda*.

The latter vessel was off Newfoundland, and giving her position by dead reckoning was 90 miles out in her calculations. The only ship which was able to discover her correct position was the *Fanad Head*, by means of the Marconi direction finder, and those on board the *Ontaneda* owed their lives to this fact.

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A Knowledge of Phillips' Code an Asset to the Telegrapher

Phillips' Code, *Latest Edition*, a thoroughly tested code of abbreviations, arranged for telegraphic purposes and contemplating the rapid transmission of press reports; also widely used as an easily acquired method of shorthand. Revised and brought up to date, with supplement to August 1, 1921. The new edition contains about 700 additions to the older code, and is indispensable to the operator who aspires to the standard of proficiency required by press associations, which includes a knowledge of Phillips' Code. Flexible cover, vest pocket size, $1.25 per copy. Address and make remittances to Telegraph and Telephone Age, 253 Broadway, New York.—Advertisement.

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Submarine Cable Tests

By J. Rymer-Jones

The following article deals with methods of measuring the C. R. and D. R. of a laid submarine cable while it is subjected to frequent "earth" or "tramway" (trolley) currents of varying strength and polarity.

Measuring the D. R.—By direct deflection:—

In spite of 10.5 n.m. of earth-cable-core at the testing end, the cable to which the writer refers is almost incessantly traversed by earth-currents of changing polarity due to electric tramway systems, causing the spot of light to make excursions all over the galvanometer scale, sometimes as much as 300 divisions or more, on the wrong side of the zero position.

In consequence of this, the mean of the excursions during, say, the first five or ten minutes with the negative testing current could not compare respectively with the mean of the first five or ten minutes with the positive current, when earth currents affected the insulation readings.

In making a D. R. test, when earth currents are strong and of unequal duration, *time* is a very important factor; and, therefore, the writer prefers a special test sheet where every minute for one hour, when testing with the negative current, and also every minute for one hour with the positive current, is divided up into 12 vertical and parallel columns, for every five seconds, to be used in case the earth currents are very unsteady.

After putting the negative current to the cable through a dead-beat galvanometer, the electrician mentions the particular moment to his assistant, who has the test sheet and a watch in front of him, and who, at exactly, say, 5-seconds interval, says in a loud voice, "Now"; and the electrician immediately calls out the deflection, observed at that moment, to be recorded by the assistant. The same procedure is gone through at exactly every succeeding five seconds for one full hour.

After this the cable is wholly discharged, and a similar test of one hour's duration is made with the reverse current.

It is a long and tedious test, but gives remarkable comparable *mean* results between the negative and positive insulations if, in each case, the test is continued for one hour.

When the E. C.'s do not change very frequently, and the deflections are consequently much more regular, readings at intervals of only 15 seconds, or more, will be sufficient.

Formula to obtain the mean deflection with either the negative or positive testing current:—

Add together all the five-second readings, if any, on the *minus* side of the scale zero during, say, 30 minutes, and subtract their sum from the sum of all the five-second readings on the *plus* side of the scale zero; then divide the result by the sum of all the plus and minus five-second readings.

This will give an approximate mean scale deflection during the first 30 minutes, which should be compared with the mean deflection during the first 30 minutes with the reverse current. Similarly, the mean of all the five-second readings, obtained in the same way, during the second 30 minutes with the negative current should compare, more or less satisfactorily, with the mean deflection with the positive current, according as the earth currents are less or more irregular. If negligible, the mean readings should be exactly the same (for both the negative and positive currents) for the same period of time. If the E. C.'s are very strong and changeable in direction, the more prolonged the test readings, and the shorter the equal intervals of time between them —say, five seconds only—the more accurate will be the calculated D. R. value.

The accuracy of the result is due to the test being prolonged over many changes in the strength and polarity of the earth currents; and also to the very important influence on the *mean* observed deflection of the *time* during which the deflections remain in approximately the same positions on the scale. During a test continued for, say, one hour with the negative current, the E. C. will probably undergo as varied changes as during one hour with the reverse current.

It should, of course, be understood that the average deflection of, say, 30 minutes—or 60 minutes, as the case may be—will give the *average* D. R. of the first 30 minutes—or 60 minutes—and not for the thirtieth or sixtieth minute respectively.

If the electric tramway—in spite of the ten miles of earth-core-cable at the testing end—keeps the dead-beat galvanometer deflection rising and falling continuously, the foregoing method of *averages* is absolutely necessary in order to get even an approximately correct D. R. value.

It is of interest that when tests were made from the other end where there is only an earth-cable-core of 1.5 n.m., and no tramway disturbance, the insulation deflections were quite steady enough to dispense with elaborate methods of testing.

The writer had much the same experience with the San Francisco-Honolulu cable, the electric tramcars at the former end causing considerable disturbance; whereas final tests made at the Honolulu cable hut were often so free from any earth currents that, when about to start testing, the electrician had to assure himself that the cable was really connected to the testing apparatus. Hence the advantage, when such different conditions are known to exist, in making the final tests from the cable end least disturbed by earth currents.

C. R. by "Bridge" Test.—So great and frequent were the reversals in the earth currents that no attention could generally be paid to adjusting the "tens" and "units" on the bridge. The method

*The Rymer-Jones reversers—both for the battery and galvanometer—are found convenient if connected up so that their handles point in the same direction; and a small fraction of a second suffices to switch both over for a reversal.

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adopted was simply to reverse both battery and galvanometer reversing-keys as nearly as possible at the same moment (*), so that *too much* or *too little* would always come on the same side of the scale-zero and confusion on this account be avoided.

The electrician has merely to confine his attention to turning the hand-knobs of the sliding contacts of the hundreds and thousands, and to keeping his eye on *the spot of light,* while quickly sweeping it along the scale to the zero to improve the balance.

After calling out to his assistant the approximate bridge reading, the electrician very quickly indeed switches over both of the R-J (*) reversing keys, and again brings the spot of light towards zero—not paying too much attention to a few divisions of error—and calls out any important changes in the resistance to be recorded.

In this way he can obtain a "series" of, say, 20 readings, the mean of which, if very quickly done, will give an approximately correct value. Three or four *series* are sometimes desirable. There is no doubt a certain amount of reliability resulting from a large number of reversals, but there is greater certainty still in judiciously selecting any series which most closely agree with each other.

It is necessary to be very quick in reversing both the battery and galvanometer, otherwise the bridge reading with one polarity may have little relation with the resistance measured with the other battery pole.—*London Electrical Review.*

Wireless News and Propaganda

The correspondents of the chief American newspapers use wireless almost exclusively from France. The American newspapers also receive most of their news from Germany by wireless. For several years France has been sending news to the Far East by wireless—first from the Lyons station and now from Bordeaux. The news is received at a French station in Shanghai, distributed by Reuter's to the Chinese press, while commercial messages are delivered by the French Municipal Council.

The Lyons and Bordeaux stations are sending regularly one-sided telegrams to Martinique (French West Indies), Madagascar, Congo, and the Far East. Each day the newspapers in these colonies also publish news received by wireless. The daily traffic was very irregular in June. The following telegrams were sent: Seventy telegrams of 912 words to Brazzaville, Congo; 370 telegrams of 5,775 words to Tananarive, Madagascar; ninety-four telegrams of 1,223 words to Martinique. In addition, information telegrams intended for all these stations amounted to eighty-seven telegrams of 32,142 words.

This record in a month when atmospheric conditions were not good is very creditable. The telegrams described as "information" consist of news much of which is no doubt in the nature of propaganda. Mr. Hughes exhibits Australian newspapers showing that these Bordeaux messages are received and printed. Information has been received from Sydney stating that at the present time Bordeaux messages are picked up at the rate of twenty-five words per minute, and can be read for fifteen hours daily.

All traffic in the Far East, the French Colonies, and other distant places is one-sided, as there are no stations powerful enough to reply. This condition would not suit Mr. Hughes, who wants to talk back. There can be no certainty of service or unity of purpose until the wireless machinery is reciprocal, and it will take a very long time to complete the Empire chain if the Post Office is to handle the business.

An illustration of the leisurely way the Post Office works is shown in an article by E. H. Shaunessy, of the Post Office engineers, in an article on the Leafield and Cairo stations, in a recent issue of the Post Office *Electrical Engineers' Journal.* He explains that the masts at Leafield were erected in 1913, and other work done, as during the war the station was used "for reception and other experimental purposes." The Post Office got out plans and estimates for equipping the Leafield and Cairo stations in April, 1919. Authority to proceed with the work was not "obtained" until July. Tenders for wireless equipment were invited in September, and for the power plant, etc., in November and December. Mr. Shaunessy adds, "The plant for the English station has only just been delivered, and its erection is now nearing completion; but the power plant for Egypt has not yet been despatched." And yet we are told that while it has taken the Post Office more than two and a half years to complete the erection of two stations, and it is likely to take at least another nine months before they are operating, this department can build the Imperial chain in eighteen months.

Apart from Imperial interests in relation to wireless, or the need for wireless to supplement cables for news, we must not overlook the part played by wireless in commercial propaganda. It is assuming prodigious proportions. Seven Greek daily newspapers have combined to erect a station for intercepting news. The front page of each paper is filled with news by wireless, and the first column in each case is occupied with messages from Nauen. It is news which is also propaganda. This also describes the thousand words of "information" circulated daily from Bordeaux. The American Radio Corporation is pouring commercial propaganda into China. These messages are picked up all over the world, and by ships at sea, and cost nothing except the expense of reception. Wherever this news goes it creates an atmosphere which is not British. We are behind in our efforts to counteract this propagandist influence in neutral countries and in British territories, which it also permeates.—Robert Donald, in the *London Daily Telegraph.*

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Pertinent Points on Government Ownership

By Edward N. Hurley
Former Chairman of the United States Shipping Board

I do not believe there is any large desire on the part of our citizens to take over the railroads or the public utility companies. They would rather not be bothered with them. The socialistic public-ownership group is a small one. Newspapers that clamor for public ownership are long on big black type and short on influence among thinking people.

If all of the managers of utilities today are dishonest, if labor is grafting, then that is the cause of their present plight, and it would not be helped by putting them under the Government—for a crook is a crook wherever he may be. The Government taking over these utilities would have to take practically these same managers and men. They are the experienced men—no others are available. But these men are not dishonest; they are honest. They would be just as honest under the Government—but they would not be so efficient. They could not be. They would be prevented from being efficient. And that is the crux of Government ownership.

The element of profit could easily be withdrawn by substituting public ownership, but would that in any way help out the management side? Could we expect a better average grade of human beings selected by a government than selected by private individuals? I began to think of the county recording offices which insisted upon retaining hordes of ward heelers to make copies of documents by hand instead of using typewriters or photography. I compared the manner of doing business of the average tax office with that of the big bank, and I could not discover any uncommon advantages offered by the municipality. The public employees, drawn from the same human fund as the private employees, did not seem to function as well. There is something about the atmosphere that makes for the limitation of effort.

I have found that men commonly drop a third of their former energy and efficiency after even a short season on the Government payroll. The railroads have had the same experience under Government operation. It extended to their managers; the men who had formerly been accustomed to settle affairs on their own responsibility found that they had to pass all important questions on to Washington. At first they resented this; soon they found it a convenient and thought-saving practice. Several of them have told me that a few more years of responsibility-passing would have made different men of them, for they found themselves shirking decisions which ordinarily they would have welcomed. They learned to dodge responsibility.

A well-organized business tries to prevent buck-passing; it puts responsibility on individuals. The Government is organized to facilitate buck-passing—nobody is ever responsible for anything—and our type of human being grows only according to the responsibility that is placed on him.

But a government undertaking merely goes back to the trough for more money. There is a big difference, and human nature, being what it is, is bound to be affected mightly. And the effect upon human nature is so great that whatever theoretical savings we may plan for public ownership are wiped out in practice by the decrease in the efficiency of the human being.

Imperial Chain of Radiotelegraphy

The Imperial Conference of Prime Ministers has endorsed the scheme proposed by the Imperial Wireless Telegraphy Committee, with some modifications. Australia has withdrawn from the scheme, but promises co-operation. Australia would be the last to receive messages, as there would be three or four retransmissions on the way, and Mr. Hughes considers that there can be direct communication, at any rate for short periods each day, between Australia and England, or through one intermediary station. Mr. Hughes on his return will put the matter before the Australian Parliament, which will be free to adopt any scheme, and Australia will take the financial responsibility.

New Zealand was not included in the list of stations outlined in the report, and Canada was also omitted. South Africa does not really form part of the Imperial chain, of which it is an offshoot. The chain is, therefore, curtailed to about one-half of the Empire, including transmission across the Atlantic, for which, however, a receiving station has not been planned. Existing stations in Canada are the property of companies.

The Post Office is to be the wireless authority for this truncated scheme. In order to expedite the construction of the stations, it is proposed to standardize all the engineering parts. The withdrawal of Australia will increase the loss which will fall upon the Post Office, the Indian Government, and the Crown Colonies by more than one-fifth. The estimated cost of each station is £185,000. The scheme does not provide for the erection of any high-powered station comparable to those now operating between the Continent and the United States or between France and the Far East.—*Daily Telegraph.*

Radio Telephones to Be Put on German Express Trains

Wireless telephone instruments will be installed on a number of important German express trains and receiving instruments will be placed in hotels and embassies in Berlin.

Experiments conducted in a moving railroad car have shown that the wireless system works well, the men engaged in the testing of the instruments being able to hold conversation with friends in Berlin. The tests were made under the observation of engineers, military attaches and the diplomatic representatives of the United States and Sweden.

It is said that in three weeks it will be possible for travelers on express trains to reserve hotel accommodations by the radio telephone.

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY

By Louis Casper

Lesson 34

We have considered the effects of both electrostatic and electromagnetic fields radiating from one wire and which is induced upon another line; but when we contemplate the combination of a group of wires such as exist on a pole line or in a cable with each conductor inducing a current of electricity upon its neighbors, the resultant action of the same becomes complex and difficult to analyze.

Imagine for a moment the characteristic of a magnetic field created by a constantly changing force in each wire and the combined effect resulting therefrom which in turn influence neighboring lines in proportion to the contiguity of the latter.

Since the time of Faraday and Henry, a stupendous amount of electrical research and experimentation has been conducted in the investigation of the effects of induction, and as a result of this and of brilliant theoretical work by Maxwell and others, the fundamental laws of electrostatics and electrodynamics has been very fully worked out. The general equations expressing the laws of induction are, however, not suitable for us in the solution of practical problems. On account, as has already been intimated, of the large number of factors involved, many of which cannot readily be evaluated, it is generally necessary in specific cases to resort to simplifying assumptions and approximations. As to what actually happens when an e.m.f. is set up in an electric circuit by induction we know comparatively little. It is even most difficult to tell just what e.m.f., or current, or electricity itself really is. We merely use these terms to express certain phenomena and relations found by observations whereby we are able to derive results of much practical value.

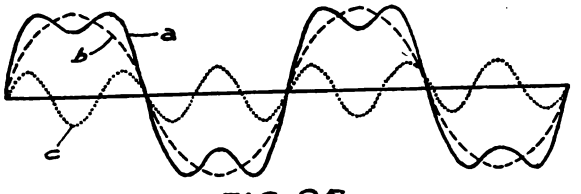

FIG. 95

Characteristics Affecting Disturbances

Many wires carry e.m.f.'s and currents of varying values, some greater, some less, dependent on three factors; the first being the value of the e.m.f. impressed upon each line; second, the gauge and kind of material composing the makeup of the conductor, and third, the length of wire from terminal to terminal (eliminating repeaters). It is quite a common occurrence to have wires with all these three characteristics on one pole line and it therefore becomes a study for those who have to deal with the assignment of circuits to avoid close contiguity, say, of a fast working long distance line with that of a wire of shorter length between terminals, due to the predominating value of current flow of the shorter line over that of the longer wire. In many cases this cannot be entirely avoided owing to the insistent demands of traffic service that each parallel circuit operate to the fullest capacity. The shorter length wire is expected to operate at a higher speed than that of a longer haul circuit, necessitating a greater operating margin for the former. It is obvious that excessive induction will reduce that margin on the short wire as well as the longer circuit, owing to the difference of output required.

In Figs. 95 and 96 are seen graphic sine wave curves which are illustrative of the effects of induction upon regular operating signals passing through a circuit. The curve *a* represents the operating current, *b* the impressed e.m.f. which creates the current, and *c* the induction. Induction coming from parallel lines are not as smooth as that shown by the curves *c*. The characteristic curves of such induction are very irregular and fragmentary. The curves as shown are made smooth and rounding for better illustration. The resultant induction from all sources makes its impress upon the regular signals and the effect of the same is to create a distortion of the former. This can be seen by observing the top of the wave of the line signals *a* in Fig. 95. At the moment this wave has reached its crest, the wave of induction has also reached its maximum, but in the opposite direction, and the result of this is a corresponding depression on the top of the wave *a* in ratio to the potential of the inductive wave *c*, which causes it.

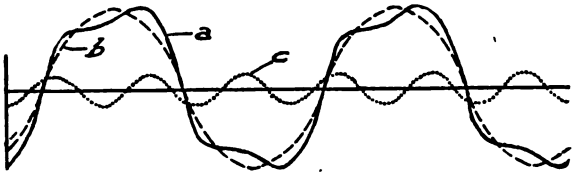

FIG. 96

In Fig. 96 it happens that the inductive wave *c* is in opposition to another section of the line signal wave *a* and therefore causes a depression in that particular section of the latter signal. The depressions as shown in the two figures are thus illustrative of line current distortions in their most elementary form. Under actual conditions, however, these distortions are extremely varied, and the resultant characteristic curves present considerable irregularity; but as long as the signals are of sufficient amplitude above and below the zero line, and the curve will show a fairly good outline of the signal transmitted regardless of distortions caused by induction, the operation of the circuit will be successful within the limits mentioned. If, however, the transmitting speed be increased with a

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consequent reduction in the amplitude of the operating current waves, the distortion caused by induction may produce false signals either of one polarity or another, resulting in "tailed" marks or "gains," as it is termed in multiplex operation, or as "drop-outs."

Power Circuits

The serious nature of the disturbance due to electric power circuits has been forced upon the attention of both telegraph and telephone companies more and more strongly for some years. Electric railways have still more recently been added to the list of disturbing causes, and it has become imperative that something should be done to prevent or cure the interference.

The power circuits that interfere with telegraph lines are mainly from alternating currents of a frequency generally of 25 or 60 cycles. These periods of current alternation are very close to that of the operating frequency of normal telegraph transmission, and hence greatly add to the difficulty of operation of the latter.

All circuits carrying a.c. power currents are insulated from the ground; but when high voltages are used, it is a difficult matter to keep this insulation high and, of course, impossible to make it perfect. There is, therefore, more or less leakage at all times from such power circuits to the poles and from thence to the earth. Therefore, leakage is the most important factor and must always be considered.

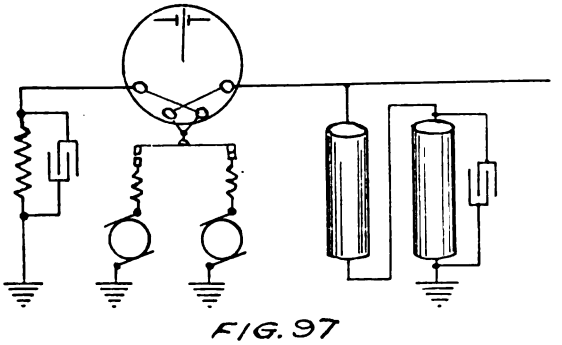

FIG. 97

The disturbances arising from these sources have proved in some localities a very serious inconvenience in telegraph operation; and although it has been always recognized that the use of metallic circuits by the telegraph companies, or the removal or entire readjustment of the disturbing circuits would prevent interference, it has been in most cases impossible to successfully accomplish the necessary changes in the disturbing circuits and the expense of an immediate and wholesale installation of metallic circuits would be an exceedingly heavy and burdensome expense.

Remedial Measures to Combat Induction

In telegraph practice the tendency has been to develop terminal apparatus so that a close definition can be made of a received signal sharply differentiating between actual operating signals and induction. The Vibrating and Combination relay arrangements are illustrative of this differentiation. The tendency of these two latter relays is to anticipate the signal and either retransmit the same as in the case of a repeater, or pass the signal to whatever receiving apparatus is employed before the signal has actually completed its cycle, thus eliminating interfering induction that may manifest itself during the development of the incoming signal.

The rotary repeater which is utilized in this country exclusively in multiplex printer operation, is the latest development of signal correction. This repeater retransmits a good signal from one that has been received in a distorted state due to induction.

Possibly the only direct methods attempted to correct parallel line induction has been in the use of drainage shunts. In the case of interference from parallel circuits, a high resistance is placed at some section of the line between the latter and the earth. The induction to some extent is supposed to flow through this drain to earth. The principal objection to this arrangement is that if the ohmic resistance of the drain is too low, a large per cent. of the operating current is diverted through the former, and whatever is gained by the drain in eliminating induction, the same is lost in the reduction of operating current at the terminal. If the drain be of a high resistance, then according to Ohm's law, the preferable path for the induction to earth would be through the terminal set.

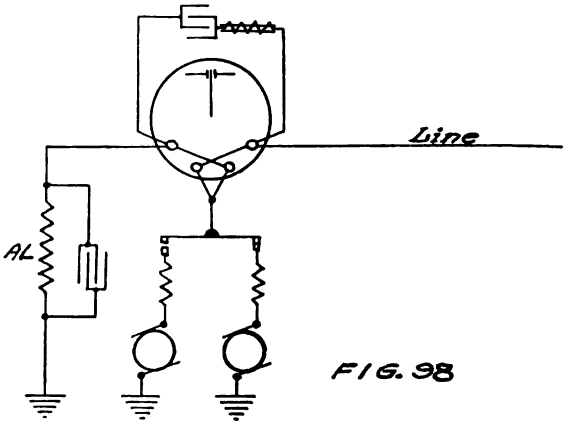

FIG. 98

A drain arrangement, however, was used by the writer on wires between Dallas and El Paso, Texas, which consisted of graphite cylinders connected up as shown in Fig. 97. These cylinders were of high resistance, but presented considerable surface for the flow of inductive current. This drain was quite successful in this particular instance.

Fig. 98 shows the application of an arrangement to drain alternating current induction and is known as a Resonant Shunt. The arrangement as described by Herbert in his book entitled "Telegraphy," is as follows: "The method is based on the fact that the current has a definite periodicity or number of alternations per second, and that an alternating current will flow through a circuit through

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which a direct current will not pass. The power circuit inducing the current alternates at 25 or 60 times per second and the induced current will also alternate at the same rate. A direct current will not flow through a condenser, while an alternating current will flow in a circuit composed of a resistance and a capacity in the form of a condenser, and if the resistance is inductive and the inductance bears a certain relationship to the capacity of the condenser, the resistance of the circuit will be that of the resistance of the inductance only. This state of affairs exists when there is what is called a resonant circuit, which is expressed in its simplest form in the following formula:

$$f = \frac{1}{2\pi KL}$$

where f = Alternations per second of the current
K = Capacity in farads
L = Inductance in henries
π = 3.1416

If, for instance, the frequency of the alternating current is 25 per second, then if K and L are of such value $\frac{1}{2\pi KL}$ equals 25, the maximum current will flow through the shunt circuit. Any other value of $K \times L$ will result in a smaller current passing through the shunt with a given induced voltage. Now $K \times L$, with K in microfarads, is a constant figure of roughly forty, which can be obtained in numberless ways. For instance, it may consist of K = 8 microfarads and L equals 5 henries, or K = 5 microfarads and L equals 8 henries. There are disadvantages with high capacity or high inductance. If a high capacity is employed it will seriously reduce the strength of signals on certain types of circuits, whilst a high inductance involves a high resistance to produce the inductance unless considerable iron is used with the coil, and a high resistance will defeat the object of the shunt. Again, if iron is used, then the inductance will vary with the current passing and the shunt will cease to be resonant at all values of current. An air coil inductance is to be preferred on this account, but the resistance would have to be high to produce a reasonabe inductance figure. With all these drawbacks, however, it is possible by means of this type of shunt to make circuits workable which would otherwise be unfit for use."

Another drainage arrangement has been used by bridging a capacity alone across the main line and artificial coils of the receiving relay. All these shunts, however, both resonant and otherwise, have a tendency to choke up the action of the main line relay and hence are not employed to any considerable extent.

(To be continued)

New Book

"Telephone Rates and Values," is the title of a book just issued from the press of The Cornhill Publishing Company, Boston, Mass. The author is Charles W. McKay, chief appraisal engineer of Chicago and New York. The price of the work is $1.50 per copy. The subjects covered in this 246-page book includes the following: Commission Form of Public Utility Regulation; Appraisal Terms; Determination of Fair Value; Direct Construction Costs; Collateral Construction Costs; The Non-Physical Assets; Preliminary Steps of Inventory; The Inventory of Real Estate and Equipment; The Outside Plant Inventory; Inventory of Miscellaneous Equipment; Preliminary Discussion of Unit Costs; Unit Costs for Real Estate and Equipment; Unit Costs for Pole Lines; Unit Costs for the Aerial Cable Plant; Outside Wire Costs; Conduit Costs; Underground Cable Unit Costs; Miscellaneous Unit Costs; Depreciation; The Function of the Appraisal in Rate-Making and Telephone Appraisement by Short Methods. The book measures 6¼ inches wide by 9½ inches in length, and the workmanship in its production is of the best.

Copies of this valuable publication may be obtained by addressing and making remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

Automatic Telephone Systems

"Automatic Telephone Systems," is the title of a book issued on August 3rd by Benn Brothers, Ltd., London. The work measures ten and three-quarter inches in length by eight and a half inches in width, and consists of two hundred and eighty-two pages. The printing and paper are excellent.

The author, William Aitken, has had as objects in producing this work, clearness and intelligent treatment of the complex subject of Automatic Telephony. Mr. Aitken has introduced a new method in the producing of his book in describing the diagrams which is accomplished in a way that renders the subject unusually intelligent to the ordinary student. It is not necessary to be an electrical expert to understand this work. Mr. Aitken says in his preface that his method of preparing diagrams has been called bus-routing, as it resembles the bus-route number used in maps of London to show the route taken by buses from terminus to terminus. The large size pages enables the author to draw his diagrams to a comparatively large scale. The field covered is practically the whole subject of Automatic Telephony. The price of the book is $10.00, and copies may be obtained at the office of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

THE "Cleveland Plain Dealer" recently took advantage of the telephone service to Havana, Cuba, to interview a detective from that Ohio city who had gone to Cuba for a criminal. Newspaper scoop was said to be a triump in long distance interviews.

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EDITORIAL COMMENT

International Communications Conference

The International Communications Conference, which has held sessions in Paris, France, for the past two months, adjourned on August 22nd. The American delegation, headed by Major General George O. Squier, chief of the Signal Corps of the United States Army, went to Paris with a definite program, most of which is said to have been adopted. The conclusions of the conference will be kept secret until presented to the various governments.

The principal contention of the Americans was that certain bands of waves should be reserved for wireless telephony. This was opposed by the Europeans, but with the backing of Japan was adopted.

Among the recommendations adopted was one by the Americans that certain waves be assigned to each country, with treaty provisions limiting each to the use of instruments adapted to those wave lengths, so that the result would be secret wireless.

It was the opinion of the conference that wireless never would supersede submarine cables, and it advocated the extension of cable facilities. The speedy elimination of static interference, which now is so serious to wireless, was predicted.

Government Views on New Pacific Cables

Construction by the Government of a trans-Pacific cable, if private enterprise proves unwilling, is recommended by Secretary Hughes and approved by President Harding in letters recently made public by Senator Jones, of Washington, author of a cable bill.

Allocation to the United States of the former German cable between the Islands of Guam and Yap was probable, Secretary Hughes said, referring to proceedings of the International communications conference.

The Federal project should be deferred until it is ascertained whether private companies will lay the line, the Secretary said, pointing out there now was only one cable between the United States and the Philippines, via Guam.

Applications for licenses to lay new cables has been made but the plans were for connections to Japan and subject, therefore, to Japanese sanction, Secretary Hughes added.

The letters were in response to a request by Senator Jones for an official expression on his bill. President Harding said, in forwarding Secretary Hughes' report, he felt sure Congress would realize the need for deferring government construction of a new cable, in view of Secretary Hughes's statement.

Regarding the German cable between Guam and Yap, Secretary Hughes said the allocation of the line still was under negotiation.

American delegates to the international communications conference have contended the service we enjoyed in the past should be restored and it is probable that the cable from Guam to Yap will be allocated to the Government of the United States, said the Secretary. Whatever the decision may be with regard to the German cables, it will have an important bearing upon any plan formulated and submitted for your approval looking to the improvement of cable communications in the Pacific.

Suggestions Wanted for Edison Memorial

Considerable discussion is now taking place as to the proper celebration or memorial of Edison's seventy-fifth birthday, which will occur on February 11th, 1922. We have been asked if the telegraph fraternity has anything to suggest to make the occasion memorable from the standpoint of telegraphy.

General Situation

More progress towards the realization of plans for the composition of the affairs of the world on a basis of sanity and common sense was made in July than in any month since the armistice was signed, says the American Exchange National Bank of New York City. The progress was really stupendous in its significance, although largely due to the culmination of negotiations going on in various quarters for months. The outstanding development of the month was the successful launching of the Washington Government's plan for a disarmament conference. Next in importance was the opening of peace negotiations between Ireland and England and the settlement of the English coal strike. The only "sore spots" left in Europe and Asia at the end of the month were those in Silesia and in Turkey, but with the differences between the dominant nations of the world approaching composition, these outlying disturbances were generally ignored.

These developments which affect the entire world as well as ourselves, were accompanied by progress of the greatest importance in business readjustment at home, and by the solution or advancement of many of our own political and Governmental problems. Progress was made in the consideration of plans for the funding of the Allied debt; the adjustment of accounts between the railroads and the Government on a basis that promised to put the railroads in funds to the aggregate amount of about $400,000,000; General Dawes, the newly appointed "efficiency expert" for the Government, reported that various department heads had agreed to savings in disbursements during the ensuing fiscal year aggregating over $100,000,000.

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

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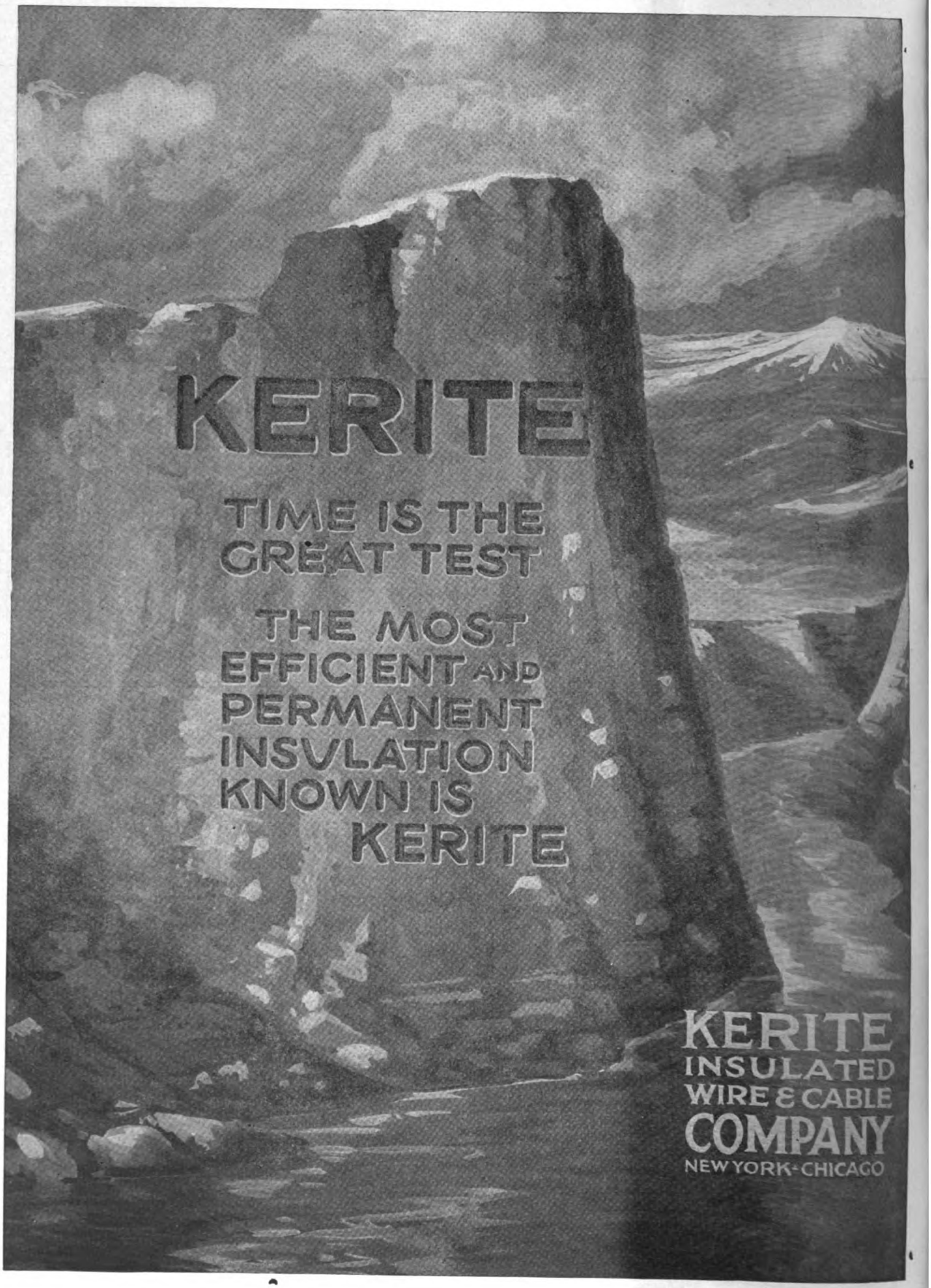

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THE RAILROAD

Telegraph and Telephone Section of the American Railway Association

H. Hulatt, manager of telegraphs, Grand Trunk Railway System, Montreal, and chairman of the Telegraph and Telephone Section, in an article entitled "Is the Telegraph and Telephone Section of the American Railway Association of Value to Telegraph Department Men?" printed in the August 16th issue of this paper, writes in that article:

"We, in the telegraph profession, are living in strenuous days; conditions are changing almost overnight. Not so many years ago a railway superintendent of telegraphs who could use the Morse code, had a knowledge of wire testing, understood the proper care of gravity batteries, how to set up a duplex or quad, coupled with a rough and ready knowledge of constructing matters, to use a common expression, 'filled the bill.' Today superintendents of telegraphs must be able to intelligently and efficiently handle simplexes, private long distance telephone circuits, phantoming of circuits, installation and care of printer telegraphs, telautographs, and other types of electrical and mechanical labor and time-saving devices. They must also have some knowledge of wireless telegraphy and telephony, inductive interference, and maybe, before very long, a knowledge of the 'Wireless Carrier System,' and other complex electrical problems, etc. They must also be posted on all the modern methods of handling traffic, economy in the use of wire facilities, etc."

The railroad telegraph and telephone officials have no doubt received by this time from the secretary, W. A. Fairbanks, New York, of the Telegraph and Telephone Section of the American Railway Association, printed copies of the reports of the various committees, constituting the telegraph and telephone section. These reports will be discussed at the Cleveland session on September 21st, 22nd and 23rd. Those who have read the reports will speedily reach the conclusion that Mr. Hulatt had not over-stated the importance of the position of the railroad telegraph and telephone officials. Included among the committee reports that will be discussed at Cleveland will be the report of Committee No. 1—Construction and Maintenance—Outside Plant, which consists of forty-eight printed pages.

Report of Sub-Committee "A"—Construction and Maintenance of Pole Lines, of Committee No. 1, 48 pages.

Sub-Committee "B"—Wire Crossings of Committee No. 1. About fifty pages.

Report of Sub-Committee "H"—Location and Layouts of Committee No. 2—Construction and Maintenance—Inside Plant.

Report of Sub-Committee "G"—Apparatus and Materials of Committee No. 2—Construction and Maintenance—Inside Plant; fourteen pages.

Report of Sub-Committee "D"—Transpositions of Committee No. 1—Construction and Maintenance—Outside Plant.

Report of Committee No. 2—Construction and Maintenance—Inside Plant.

Report of Sub-Committee "J"—Circuits and Current Supply of Committee No. 2—Construction and Maintenance—Inside Plant, sixty-four pages.

Report of Sub-Committee "K"—Installation and Maintenance of Committee No. 2—Construction and Maintenance—Inside Plant, twenty-four pages.

Report of Committee No. 3—Protection Against Electrolysis.

Report of Committee No. 4—Protection Against Lightning or Electric Light and Power Circuits, twenty-four pages.

Report of Committee No. 5—Telegraph and Telephone Development.

Report of Committee No. 6—Message Traffic, twenty pages.

Report of Committee No. 7—Inductive Interference, sixteen pages.

Supplemental Report of Committee No. 7—Inductive Interference.

Report of Committee No. 9—Future Activities and Topics.

Report of Committee No. 10—Technical Training.

Report of Committee No. 11—Telephone Transmission.

Report of Committee No. 12—Radio and Wired Wireless, forty-four pages.

It will be realized from the foregoing that the Cleveland session will be an active business meeting from start to finish.

Those who neglect to attend the coming session will miss an educational opportunity that seldom presents itself.

The printed committee reports have been mailed in ample time to afford every opportunity to study them in all their details, and every official should make it his business to be prepared to point out conditions that have not been fully covered or have been overlooked. The printed Proceedings of the Cleveland session will furnish standardized methods that will be well for all interested to follow.

In addition to the above program, two papers will be presented to be read at the meeting, one prepared by the American Telephone and Telegraph Company, and one by Stanley Rhoads, telegraph and telephone engineer, New York Central Lines, New York. Mr. Rhoad's paper is entitled "Some Phases of Railroad Telegraph and Telephone Engineering."

———o———

CHARLES A. PLUMLY, superintendent of telegraph of the Baltimore and Ohio Railroad, Baltimore, Md., who was taken seriously ill last November and underwent several operations for appendicitis, is gradually resuming his duties with the railroad company, after an absence of eight months. At present Mr. Plumly is working only half time, in order to conserve his strength, but he is expected

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to be in condition to resume his entire official duties in a short time. A few days ago Mr. Plumly made his first appearance at the office since the beginning of his illness last fall, and was given a warm welcome.

Annual Meeting of the Telegraph and Telephone Section of the American Railway Association

In connection with the annual meeting of the Telegraph and Telephone Section of the American Railway Association, to be held at the Hotel Cleveland, Cleveland, Ohio, September 21st, 22nd and 23rd, the arrangement committee desires to have it announced that through the courtesy of the Telegraph and Telephone Appliance Association the usual "Get Together" reception will be held at the Hotel Cleveland, Tuesday, Sept. 20th, at 8 p. m., Eastern Standard Time, on which occasion the arrangements will be announced by the committee and interesting features unfolded. The committee would like a full representation of members and guests at the "Get Together" reception.

THE office of E. C. Keenan, general superintendent of telegraph, New York Central Lines, has been moved from the Grand Central Terminal Station Office Building, to the new sixteen-story general office building, erected by the New York Central Lines at 466 Lexington Avenue, which building occupies the block facing on Lexington Avenue, between 45th and 46th Streets and Grand Central Terminal, New York City.

The Ohio Wire Laws

A conference was held at the American Railway Association offices, 75 Church Street, New York, of representatives of Western Union and American Telephone and Telegraph Companies in regard to specifications which an Ohio committee of wire using companies intend to draft for presentation to the Public Utility Commission of Ohio for issuance in compliance with the Ohio Law recently enacted in regard to wire matters.

Telegraphy and Telephony Committee

President McClellan, of the American Institute of Electrical Engineers, has named the following communication engineers to serve on the Institute's Telegraphy and Telephony Committee during the year beginning August 1:

Donald McNicol, chairman; O. B. Blackwell, C. W. Burkett, G. A. Cellar, R. E. Chetwood, L. W. Chubb, E. H. Colpitts, C. E. Davies, F. E. d'Humy, D. H. Gage, H. Hulatt, F. H. Kroger, L. F. Morehouse, W. O. Pennell, Stanley Rhoads, Col. Edgar Russel, A. E. Silver, A. B. Smith and F. A. Wolff.

Mr. McNicol also has been appointed a member of the Board of Examiners of the Institute, and of the Publications Committee.

A SUIT has been brought against one of the telephone companies for $2,500 damages because the telephone was removed from a residence and thus deprived the inmates from gossiping with neighbors.

Old Time Telegraphers' and Historical Ass'n

The invitation issued by the Richmond Committee of the Old Time Telegraphers' and Historical Association to the membership to attend the reunion to be held October 18th, 19th and 20th, opens with the following unique preamble:

"On to Richmond (October 18th, 19th and 20th). 'Long 'bout sixty years 'go 'we uns' used every 'ground wire' then known to keep some of 'you uns' from getting a 'circuit' into this city—Yes—Sir-ee, we sure did; but today we are all pulling shoulder to shoulder for (then follows cut of Old Glory).

"We are now 'calling' you to 'answer' our invite to attend the thirty-eighth Reunion and fifty-ninth anniversary with anticipation of great pleasure in renewing old and forming new acquaintances, which we hope may not have a 'break' until the Supreme Wire Chief has given us the final 'G N.' That invitation is equally cordial to our friends under the 'Union Jack,' regardless of Yorktown being close by, and October 19th, being the anniversary of Lord Cornwallis's parole—the original copy of which can be seen in the State Capitol."

A response card is enclosed with the announcement, which those intending to be present at the reunion are asked to mail to President Jo Lane Stern, Richmond, Va.

It is more than likely that a special car will convey the New York delegation to Richmond, and those in the vicinity of New York wishing to join the party should communicate with the secretary, Thomas E. Fleming, 195 Broadway, New York. Quite a delegation is expected from Canada. Those from Eastern Canada will likely join the New York party and accompany it on the special car. While the train is enroute to Richmond it will no doubt pick up members at the points through which it passes.

It will be helpful to the working out of the local committee and the general carrying out of the program, if the members who intend to be present at Richmond will convey this fact to the president of the Association, President Jo Lane Stern.

Be an Authority on the Telegraph

"Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, offers the most complete study of the telegraph ever published. This standard text-book has been revised and brought up to date, and in addition to numerous diagrams and complete information covering the study of the telegraph, includes full descriptions of the newest apparatus adopted by the Western Union and Postal Telegraph companies, and the equipment of a modern telegraph office. This valuable book, with its 488 pages, 250 illustrations, and carrying an appendix of 24 pages and 16 illustrations covering the new Western Union Multiplex System, is the most sought after electrical book on the market. $2.50 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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The International Association of Municipal Electricians

The 26th annual convention of the International Association of Municipal Electricians will be held at the Antler's Hotel, Colorado Springs, Colo., September 6th, 7th, 8th and 9th.

This association is an organization composed of those men who are at the heads of the electrical departments of the municipal governments, such as city electricians, electrical inspectors, superintendents of fire alarm and police signal telegraph systems and superintendents of municipal electrical affairs.

This is strictly a municipal organization for the upbuilding and increasing the efficiency of those heads of electrical departments of which its members are in charge.

Among the papers to be read and discussed at the coming convention are:

"The Relation of the National Electric Code to the Electrical Industry," by William S. Boyd, secretary, Western Association of Electrical Inspectors, Chicago, Ill.

"Ornamental Street Lighting," by L. A. S. Wood, manager of the illuminating section, supply department, George Cutter Works, Westinghouse Lamp Works, New York.

"Paper Insulation vs. Rubber Insulation for Fire and Police Underground Cables," by T. P. Sandiford, city electrician, Savannah, Ga.

"Mountain Transmission Line Problems," by James E. Dostal, manager, Colorado Springs Light, Heat & Power Company.

"Value of a Modern Fire Alarm System With All Underground Service," by William G. Dey, superintendent fire alarm, Louisville, Ky.

"Revision of Fire Alarm Installation Rules—From 1920 Report," by John W. Kelly, Jr., chief Electrical Bureau, Camden, N. J.

"Lighting Protection Problems of Colorado," by B. J. Wheatlake of the General Electric Company, Denver, Colo.

"Suggestions to Municipal Fire and Police Alarm Superintendents," by Chas. F. Maulen, Dallas, Tex.

"Simplified Pulling of Fire Alarm Box—Continued from 1920 Meeting," by Claud E. Convers, city electrician, San Antonio, Tex.

"Wireless Signaling and Its Relation to Fire Alarm and Police Telegraph," by Chas. K. Aheard, superintendent, fire and police systems, Waterbury, Conn.

"Street Traffic Signals, Electrical," by Engineer of one of the large manufacturers of street traffic signals.

"Signaling Systems as Applied to the Necessity and Convenience of Police Departments," by E. E. Salisbury, signaling engineer, Boston, Mass.

Address by Clarence R. George, city electrician, Houston, Texas.

Trouble Problems and Discussion of same by members.

"Report of Standardization Committee," by R. A. Smith, superintendent of electrical affairs, and chairman of Standardization Committee, Norfolk, Va."

There will be other important subjects which will be brought up at this meeting concerning the affairs of the various municipal electrical departments.

R. C. Turner, of Atlanta, is president of the association, and Clarence R. George, city electrician, Houston, Texas, is secretary.

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Telephone Pioneers of America

The report of the proceedings of the seventh general meeting and annual convention of the Telephone Pioneers of America, held at Windsor Hotel, Montreal, September 10th and 11th, 1920, is now being distributed by the secretary of the association, R. H. Starret, 195 Broadway, New York. The seventy-six page book is interesting from cover to cover, and it will be appreciatingly received by every member of the association. The book is also valuable from a historical standpoint and we regard it as an important addition to our library.

The large body of Pioneers will no doubt realize that their association is in efficient hands. A glance at the names of the officers is convincing of this fact.

The Telephone Pioneers of America will hold its annual meeting this year at St. Louis, Mo., on October 24th and 25th. St. Louis is the headquarters of the Southwestern Telegraph and Telephone Company, and H. J. Pettengill, chairman of the board, is the vice-president of the Telephone Pioneers of America. Mr. Pettengill will no doubt have charge of the coming convention, and anyone who enjoys the acquaintance of Mr. Pettengill knows what that means.

There will no doubt be a large attendance at the St. Louis reunion, and it is more than likely that a special train, starting from New York, will convey the delegates to that place, picking up members enroute.

Additional information, if desired, will be furnished by R. H. Starret, the secretary.

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Cable and Telegraph Concessions

The *Electrical Review*, of London, states that a bill authorizing a concession to lay a cable between Italy, Spain, Brazil, Uruguay and the Argentine was introduced at Rome, Italy, on July 23rd, and the London *Times* reports that the Russian Soviet Government has granted a concession for telegraphic connection between Russia, Denmark, Japan and China to a Scandinavian company (probably the Great Northern Co., which has been for some time in negotiation with the Russian Government over such a concession).

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PERSONAL

M. A. Noss, chief engineer of the Telepost Company, New York, is engaged in wire and radio communication research work in conjunction with P. B. Delany.

POSTAL TELEGRAPH-CABLE COMPANY

W. C. DAVIET, assistant to the general manager, is spending a few days at Delaware Water Gap.

WM. B. DUNN, secretary of the company, is enjoying a few weeks' rest.

F. J. KERNAN, auditor, is rapidly improving in health, and it is expected that he will soon be back at his desk.

C. E. BAGLEY, superintendent, Philadelphia, was a recent New York visitor.

MRS. A. Mills is acting as day manager at the Claridge Hotel in place of Miss Prendergast, who has been granted a leave of absence of several months.

JOHN OLLA, the "BTC" who gives Philadelphia and Boston five minutes service, is back after being away three weeks with a sprained ankle.

MRS. F. Rigney, who works first Pittsburgh bonus, handled 13,556 messages without an error for the month of June. Florence is one of the stars that graduated from the Postal school.

MISSES M. Sullivan and K. Clifford, who work the first Boston bonus, are also Postal school graduates.

CHIEF Clerk Vincent Calvanezzi, of the Hudson Terminal branch, is the proud father of a son.

OPERATOR Muller, of the Cedar Street office, is relieving Manager Ostrander of the 1504 Third Avenue branch, who has been granted an extended leave of absence on account of ill health.

MISS I.. Kreshefsky, manager of the 77 Bowery office, is back at her desk after an absence from duty due to poor health.

MANAGER William Anderson, of the 520 Hudson Street branch office, was married recently and the happy couple have our best wishes.

G. WARNOCK has been promoted from the managership of 102 West 104th Street office to the managership of 263 West 125th Street office.

LEONARD RIBARO, formerly day operator at 173 East 125th Street, has been appointed manager of 102 West 104th Street office, vice G. Warnock, promoted.

JOHN TOBIN, formerly of the 45 Broadway office, has been promoted to be chief clerk of the 8 East 42nd Street office.

OPERATOR Chas. T. Hoyt has been transferred to the Pennsylvania Station branch.

OPERATOR A. Kirschner has been transferred from the Pennsylvania Station to 154 East 23rd Street office.

OPERATOR Frank Mead has been transferred to the 26 Cedar Street office.

CHARLES E. STUMP, manager of the Dock Street, Philadelphia, office, passed through New York on August 21st on his way to Wood's Hole, Mass., where he will spend a few days with his old friend, H. G. Haddon, president of the Martha's Vineyard Telegraph Company. Before Mr. Stump returns to duty in Philadelphia he will visit Oak Bluffs and Nantucket, Mass.

C. M. BAKER, general superintendent of plant; C. L. Bennett, cable supervisor, and H. E. King, cable foreman, were in Duluth, Minn., recently, laying a submarine cable across the St. Louis River at Grasy Point Bridge. The cable will be used jointly by the Postal Telegraph-Cable Company and the Soo Line Railroad. It is a 20-pair cable, 2000 feet long. Upon completion, the cable tested O. K. and was immediately put into service.

J. P. TROY, who for many years has been chief operator at Springfield, Ill., has been appointed manager in that city.

B. L. BLASIER has been appointed manager at Charlotte, Mich.

D. H. STEIN, assistant manager at Detroit, Mich., is the proud father of a son.

A NEW branch office has been opened in the New Wolverine Hotel at Detroit with Miss Hanbury in charge during the day and Miss Ida Goldberg at night. Branch offices will also be opened in the First National Building of Detroit and in the General Motors Building. These two buildings are said to be the largest of their kind in the United States.

D. W. WILSON, former Postal employee and now superintendent of telegraph of the Ford Motor Company, also superintendent of telegraph of the Detroit, Toledo and Ironton Railway, is spending his vacation at Sandusky, Ohio. Mr. Wilson, through his own efforts, has attained the responsible position he now holds.

THE Ford Motor Company is now making almost three cars a minute, and a prominent automobile sales manager remarked to our Detroit manager that his only fear is that the people will start buying Fords in pairs the same as they do shoes.

Managers Appointed

H. Tier, Orange, N. J.; W. B. Bennett, Berkeley, Cal.; Gladys Shackleford, Hopkinsville, Ky.; L. F Coxe, Meridian, Miss.; G. C. Wood, Greenville, N. C.; Mrs. L. R. Fanning, Blackville, S. C.; Mrs. G. E. Block, Michigan City, Ind., and M. Hilton, Bakersfield, Cal.

Russell Lowerre Bruch

The funeral service for the late Russell Lowerre Bruch was held at the home of his grandmother, 875 Park Avenue, New York, August 15th, his

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remains having been recovered not far from the point where he embarked in his canoe at Sound Beach, Conn., after enjoying a swim with a party of friends. He was doubtless upset, and owing to high seas was unable to reach shore, although an expert swimmer.

Mr. Bruch was the only son of Major Charles P. Bruch of the Postal Telegraph-Cable Company, and grandson of Captain Samuel Bruch, who during the Civil War was superintendent of telegraphs of the Military Division of Mississippi, with headquarters at Louisville, and also general manager of the Southwestern Telegraph Company.

Young Bruch was educated at Phillips Academy, Andover, and at Princeton University, Class of 1917. He was a member of the Campus Club, at Princeton, the Princeton Club of New York, the Aero Club of New York, the Ohio Society of New York, the Society of the United States Military Telegraph Corps, the Madison Avenue Methodist Episcopal Church, New York, and as a boy was associated with the Knickerbocker Grays in New York. He was also a Mason, affiliated with Sea and Field Lodge, No. 1, New York.

He enlisted as an aviator in the recent war and saw service in France. Since the war he had been engaged in the stationery manufacturing business. He was twenty-seven years of age and not married.

Mr. Bruch was a young man of the highest standing and a general favorite.

Commercial Cable Company

Death of John D. Gaines

John D. Gaines, superintendent of the Commercial Pacific Cable Station at Shanghai, China, who was in Nova Scotia on holidays, died at Tatamagouche, N. S., on August 11th, after a very brief illness.

Mr. Gaines was born in Tripoli on July 24th, 1857. His father was the United States consul there at the time. When Mr. Gaines was still a boy his father relinquished his position as consul at Tripoli, and becoming associated with telegraphy, assisted in laying the 1869 French Atlantic cable to America. Mr. Gaines, who was educated at Duxbury and Hingham, Mass., also decided to adopt telegraphy as a career, and he started work with the Anglo-American Cable Company at Duxbury. He was stationed there from 1874 to 1884, and in the latter year joined the Commercial Cable Company. From 1884 to 1902 he was at Canso, N. S. In 1902 he was appointed superintendent of the Commercial Pacific Cable Company's station at Honolulu, where he served until 1909. While there he received a message of thanks from the Governor of Hawaii for his excellent work in connection with the cable service. In 1909 he was transferred to Shanghai, where he served until the time of his death, except while at home on leave.

Mr. Gaines was a member of the American Chamber of Commerce at Shanghai, and an active member of the prominent clubs there. During Mr. Gaines' stay at Shanghai, he made many friends and the news of his death was received with much regret by the foreign colony there. Before leaving Shanghai Mr. Gaines was tendered a reception by the members of the different telegraph companies at Shanghai, and also by the clubs in Shanghai. He was also the recipient of many valuable tokens of esteem.

Senator Marconi's Prediction

Natural static electrical disturbances and interference from other stations, the two greatest enemies of wireless communication, are being mastered, and the day is not far away when wireless telephones may be used between Europe and America, Senator Marconi informed the stockholders at the annual meeting of the Marconi Wireless Telegraph Company, Ltd., at London, on August 24th.

Senator Marconi is centering attention on perfecting wireless telegraphic communication rather than on the telephone because speaking lines, he said, are believed easily obtainable when other conditions have been mastered. Referring to tests he has made, Senator Marconi said:

"Results obtained during the last few weeks by combinations of various devices and inventions are of signal importance, and I believe that if we have not completely mastered the troubles arising from adverse atmospheric conditions we have gone far enough to enable me to tell you this work is of transcendental importance and epoch-making in the conduct of the wireless telegraph services throughout the world. New arrangements not only enable communication to be carried on under conditions which previously made it impossible, but also allow a very considerable increase in speed and improvement in accuracy."

He stated that his company hoped to make arrangements with the English Postoffice for a telephone service with several countries in Europe. and concluded: "It is quite within the realms of possibility that, having means of experimenting with their telegraphic stations, they might thereafter supply the telephonic means of communication, besides the direct wireless telegraph service, but one must exist before there is a possibility of the other."

The D. R. Operator Killed

The last message sent by Lieutenant V. W. Wicks, radio operator on the ZR-2, which was wrecked on August 24th, at Hull, England, read: "The ship's back is broken. We are afire and falling. We——" Here the message ended. Lieutenant Wicks was among the killed.

Peter Cooper Hewitt, aged sixty years, a noted scientist and inventor, residing at Ringwood, N. J., died in a hospital at Paris, France, on August 25th. Mr. Hewitt was the inventor of many electrical devices, including the Cooper Hewitt incandescent lamp.

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WESTERN UNION TELEGRAPH CO.

Eastern Division

GENERAL Superintendent H. W. Taff of Washington, D. C., is at Atlantic City.

FRANK E. COYLE, of the New York executive offices, is at Asbury Park.

E. R. SHUPE, operating engineer, has returned to his office after a brief sojourn in Maine and New Hampshire.

MISS Ruth E. Daniels, relief manager in first district, is spending her vacation with friends at Middletown and Buffalo, N. Y.

MRS. C. G. Hopkins, relief manager, first district, has been temporarily assigned to the Norwich, N. Y., office, vice Miss Balcom, absent on account of illness.

New York Western Union

JAMES F. MCGUIRE, night chief operator of the general operating department, died of pneumonia on August 27th, after a few days' illness. Mr. McGuire was born in Providence, R. I., in 1863, where he learned telegraphy, coming to New York in 1879, and since 1889 he had been identified with the Western Union Telegraph Company's New York main office in various capacities. He was a popular official and a man of excellent character. The funeral services were attended by a large circle of his associates and friends.

ABSENT on Vacation—A. M. Lewis, assistant chief operator, in the Adirondacks; and George Mittag, clerical supervisor, Loch Sheldrake.

RETURNED from Vacation—H. M. Heffner, chief operator, Commercial News Department; R. L. Francis, acting supervisor; Benjamin Applebaum and Mrs. L. Cunningham.

THE fourth annual dance of the Service Local Club and Local Assembly 109, Association of Western Union Employees, will be held on October 14th at the Hotel McAlpin. This will be one of the gala affairs of the season, and a large attendance is expected. Mr. Jablin has charge of the event.

LOUIS KALICHSTEIN, secretary of Clerical Assembly No. 80, has resigned to engage in other business in Washington, D. C

WILLIAM TRACY, of the general operating department, New York, has had charge of the West Point, N. Y., office during the absence of Manager Bligh.

Chicago

THE wife of L. F. Baker recently died after several years of illness. Mr. Baker, who is one of our oldest employees, has the sympathy of his associates.

A BRANCH office has been opened in the new Wrigley Building, which is situated at the north end of the new Michigan Avenue Bridge. Albert Otte, formerly of BN Office Branch at 340 North Clark Street, is manager.

J. E. MEANEY, ex-manager of one of our branch offices, has located in Cincamonga, Cal. Mr. Meaney went west for his health, and writes that his condition is very much improved.

COMMERCIAL Agent F. S. Jones has returned from an Eastern auto trip, to which his vacation period was devoted.

DISTRICT Commercial Manager Long has hied himself to Wisconsin to spend his vacation. It is expected that Delivery Supervisor Lindstrom will soon follow suit. He is about due for his annual visit to the summer resort section.

GENERAL Manager F. H. Mohr and his wife passed through Chicago enroute for Mercer, Wis., where they spent several weeks.

I. N. MILLER, the Cincinnati retired superintendent, goes to Florida in the winter, to Sandusky, Ohio, in the spring, and to Duluth, Minn., in the summer, always to fish.

GENERAL Manager and Mrs. A. C. Cronkhite, of Chicago, are spending the vacation season in Colorado.

THE mountains seem to be attracting more than their usual share of Western Union tourists this summer. Superintendent and Mrs. A. A. Montgomery, Cincinnati, and Superintendent and Mrs. E. W. Grob, Columbus, Ohio, have just returned from Colorado, where they spent two weeks sightseeing.

ED OLSON, manager of B Branch Office, Chicago, is sojourning in the wilds of Wisconsin. The initial week found District Cable Manager Carney and Manager B. F. Stone of the Palmer House branch, in the same vicinity.

W. H. CLARKE, district commercial manager in charge of the Northside, is spending his vacation in and about the home town.

J. D. CLARKE, of Superintendent Brown's office, is visiting relatives in the East while on his vacation.

Cincinnati

CHARLES KIRBY, Messenger 1, and Robert Danford, No. 3, of the Hamilton (Ohio) staff, were visitors here recently. They journeyed down by wheel, some thirty miles, and were given the key to Cincinnati. After inspecting our office they went to the Zoological Gardens. Cincinnati is noted for having one of the finest zoos in the world, and if any readers of the AGE touch here the Gardens should be included in the itinerary.

MISS R. Hall, chief clerk to L. R. Scholl, city superintendent, is sojourning at Atlantic City.

W. F. OTHLING, on Superintendent Scholl's staff, has just returned from a motor trip across the State.

E. W. SMITHERS of President Harding's staff, Washington, D. C., spent August among friends in Saratoga.

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A SEASONAL office has been opened at Camp Perry, near Port Clinton, Ohio, where the various units of the Ohio National Guard will be encamped until August 22nd, after which the National Rifle Tournament will take over the camp until well into September.

A NEW location has been secured at Washington C. H., which is now being fitted up, and when completed will be one of the representative independent offices in Ohio.

Speed Demons of Racine, Wisconsin

Not satisfied with lowering all records on routes, Arthur Leissner and Earl Snyder, Messengers No. 1 and 2, entered the Y. M. C. A. annual bike race held recently to demonstrate to the general public that they are the real speed kings of Racine, as they claim to be. The race had fifty entries, 6½ miles, Earl Snyder taking second prize, time, 24 minutes and 44 seconds, being nosed out of first place by about 10 feet. At the 5½-mile post, Arthur Leissner was leading all entries by three-quarters of a mile, when his chain broke. Leaving his bike, he ran the balance of the distance, finishing in sixth place. Five thousand people witnessed the race. Manager Winbourn remarks—"While I had known for some time that we have the fastest messengers on the Lake Division, I have been awaiting just such an opportunity to present the facts."

Managers' Training Office, Niles, Michigan

During a period of ten months ending July 31, the Lake Division used seventy-seven managers graduated from the Managers' Training Office, which is located at Niles, Mich., under the supervision of R. H. Underwood.

During that period the second district has used thirty managers, the third district twenty-four managers, and the fourth district twenty-three managers, the assignments being made to small and medium size offices and as relief managers. In some cases the graduate manager has been sent to the training office for review, having been appointed without training. In such cases the managers returned to the office from which they came.

Every manager from the training office has been trained to handle a Western Union manager's work in every detail. Several of the managers have been promoted to larger offices in a short time after their start at some small office, the training received at the training office being equivalent to several months' actual work.

The time spent at the training office varies according to the previous experience of the student manager, but is usually about one month. When a manager is withdrawn the district superintendent replaces him with another student manager, which always assures a supply of trained employees.

The training office was visited August 5th by the following officials from the Central and Lake Divisions: Messrs. A. D. Bradley, A. C. Cronkhite, W. McD. Milne, W. T. Davis, A. R. McGrath, J. F. Haas. Other recent visitors were: J. E. Riley, district manager, second district; E. W. Malloy, district commercial agent, second district.

Association of Western Union Employees

The three-day session of the second annual assembly of the Eastern Division Association, Western Union Employees, closed August 12th, at the Hotel Rennert, Baltimore, Md. Delegates from all the large cities of the East attended. Among them were P. F. Harrington of Boston, division vice-president, and Nelson E. Ross of Washington, D. C., secretary. F. J. Cooney was delegate from Baltimore.

The Association is an independent nation-wide body composed of about 35,000 members, all of whom are employees of the Western Union Telegraph Company. It was formed to bring about better working conditions and other material benefits for the great number of Western Union workers in the United States and Canada.

Eight division assemblies of the organization have legislative powers. They meet on the second Tuesday of August in various cities of the country to elect 24 delegates to attend the national assembly, which will be held this year in Detroit in September. The Eastern district is the largest of all, both geographically and numerically.

Classification of all employees, with a definite salary for each division, was advocated on August 10th by the Western Union Employees' Association in annual convention at the West Hotel, Minneapolis, Minn.

The convention will seek no salary adjustment, but its indorsement of a classification system will be carried to the general assembly of employees' representatives at Detroit. A committee will be named at Detroit to make demands of the company. Two representatives and two officials of the company are now working on a classification system. A seniority class, with provisions for hours, vacations and promotions, was recommended by the delegates in Minneapolis. Group insurance was explained to the delegates.

CANADIAN

A. J. Clark, Agent, Canadian Pacific Railway Company's Telegraphs, Vancouver, B. C.

A. J. Clark was born in Halifax, N. S., on July 31st, 1881, where, at the age of fifteen years, he began his telegraph career with the Canadian Pacific Railway Company's Telegraphs, as messenger, July, 1896. He was advanced to clerk May, 1898, and operator November, 1900. He resigned May, 1901, to enter the service of the Western Union Telegraph Company at Halifax, afterwards spending some time with the Great North Western Telegraph Company in Montreal, and with the Associated Press at Providence, R. I. In June, 1904, he reentered the service of the Canadian Pacific as operator in Vancouver, B. C., and was promoted to a chiefship June, 1907, and January, 1911, to the position of agent.

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Radio Corporation of America

E. J. NALLY, president, sailed for Europe August 23rd, on the steamer *Aquitania*.

G. L. USSELMAN, formerly enginer-in-charge of the Tuckerton station, has been transferred to the new station at Rocky Point, L. I., as engineer-in-charge. He is succeeded at Tuckerton by A. W. Aird.

MESSRS. A. E. Reoch, assistant chief engineer; R. C. Edwards, architect, and E. E. Bucher, commercial engineer, enjoyed their vacations at Belmar, N. J.

WILLIAM COCKETT, manager of the 933 Broadway branch, New York, spent his vacation with his wife and son in the Catskills.

W. A. WINTERBOTTOM, traffic manager, was a recent visitor in Montreal.

G. H. PEARSON, traffic manager, Marconi Wireless Telegraph Company, Ltd., of Montreal, Canada, was in New York recently on a brief business trip.

All America Cables

J. H. STATLER, vice-president, arrived from Europe on August 15th.

VICE-PRESIDENT A. Davidson left on August 13th on his annual vacation.

W. S. BUCHANAN, who with Mrs. Buchanan, left New York on August 3rd, arrived at Rio de Janeiro on August 18th.

C. H. CRISSON has been appointed manager of the company's new station at San Juan, Porto Rico.

CAPTAIN and Mrs. George A. Bicknell welcomed a little girl to their family on Wednesday, August 10th. Captain Bicknell, who is connected with headquarters in New York, is a veteran of the World War and did staff duty with the Military Intelligence Department.

OPERATORS Charles Frink and James J. O'Donnell have been transferred to Fisherman's Point, Cuba, and sailed from New York on August 27th.

THE personnel of the new stations in Porto Rico are as follows: Ponce—Robert S. Hamilton, manager; operators, A. P. Burke, F. L. Henderson and L. C. Proudfoot. San Juan—C. H. Crisson, manager; supervisor, W. J. Hoy; operators, George Rosenthal, William Hayes, Jr.; accountant, E. H. Sutton.

Death of "Artie" McArdle

Arthur McArdle of Detroit, Mich., for forty years one of the best known telegraphers in the United States, was run down and killed in one of the streets of that city by a motorcycle on August 11th. Interment was at Windsor, Ont., on August 13th, and the ceremonies were attended by hundreds of Detroit telegraphers as well as operators from New York and Washington.

Mr. McArdle was born in Windsor, Ont., October 30th, 1869. He learned telegraphy in 1894.

In telegraph circles in most of the largest cities of the country, the name of "Artie" McArdle will be recalled as one of the brilliant telegraphers, a delightful companion and a valued friend. In the field of commercial, press, broker and racing telegraphy he attained the foremost ranks. He returned to the Western Union Telegraph Company's service in Detroit in 1908 and was supervisor in the main office until eighteen months ago, when he resigned to re-enter the brokerage business.

Mr. McArdle is survived by three sisters, Mrs. Mary Kelly and Mrs. T. P. Sullivan of Detroit, and Sister Daniel of St. Mary's Convent, Windsor, Ont., and two brothers, Hugh, of St. Louis, and John, formerly and for many years chief operator for the Western Union Telegraph Company, and still connected with the wire forces of the Detroit office.

———o———

Edison One of the Best Known Men in the World

T. C. Martin has just received from India in Gaparati a copy of his "Life of Edison," written a few years ago in association with Frank L. Dyer, of the Edison Laboratory staff, and published in two volumes by Harpers. The author of the translation is Rewashanker O. Sompura of Palitana, India. Mr. Martin confesses to a fair working knowledge of two or three languages, but admits his inability to test the accuracy of this performance in one of the oldest written tongues of Hindustan. At the present moment, negotiations are in progress for a translation of the same successful book into Japanese. When Ibanez was here he remarked that, as this incident would go to prove, Edison is the best known living American—with perhaps that Edison pioneer, Henry Ford, as a good second.

———o———

Submarine Telephony

A device by which, it is claimed, it will be possible to "harness telephone lines to submarine cables," has been invented by Messrs. Gaston Vincent and Louis Duverger, two French engineers.

The French Government has sanctioned experiments with the invention over the submarine cable between Antibes, near Cannes, and Saint Florent, Corsica. The cable has a length of only 125 miles, but it is claimed that the new principle can be applied to all existing submarine cables.

———o———

Adverse Exchange in China

One of our agents in China writes: "The adverse exchange for us has had its effect on curtailing imports of all kinds from America. It takes two dollars and twenty-two cents in Chinese money to make one good American dollar. However, the purchasing power of the dollar of local commodities, such as renting homes, food, travel, handmade shoes, clothing and everything local, is far greater than the purchasing power of the American dollar in America. To be sure, when we have to buy imported things, then it is when we have to pay and wince as we do so."

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CONTENTS

Circuit Reading of the Primary and Secondary Line Switch. By Harry E. Hershey. (Continued from page 387, September 1st Issue)..... 410

Smith and Campbell's Automatic Telephony..... 412

Origin and Development of Radio Service in America. Old Time Reminiscences of Henry E. Hutchens of Washington, D. C..... 415

Radio Signals From Mars. Telegraph and Telephone Life Insurance Association 417

A Peculiar Electrostatic Phenomenon. Edward C. Newton. Colonel Robert C. Clowry 418

Student's Course in Technical Telegraphy. By Louis Casper. Lesson 35 419

Editorial—The Radio Corporation of America Buys International Radio Telegraph Assets. Young Men. American Radio Relay League at Chicago 422

The Railroad—Program, Fourth Session, Telegraph and Telephone Section, American Railway Association 425

Statistics of Annual Meetings of the Association of Railway Telegraph Superintendents 427

The New Salt Lake City Western Union Office. By Frank D. Giles of Los Angeles. Obituary 429

Personal. Postal Telegraph-Cable Company. Telephone Pioneers of America 430

Western Union Telegraph Company 431

All America Cables. Radio Corporation of America. French Cable Staff Honors Retiring Officials 432

Pacific Cable Board. The Root of Efficiency. By an Official..... 433

A Radio Tournament. The Yap Controversy Settled. Canadian..... 434

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Circuit Reading of Primary and Secondary Line Switch

By HARRY E. HERSHEY,
Of the Automatic Electric Co., Chicago

(*Continued from page 387, September 1 issue*)

In Fig. 27 is shown a primary line switch H, secondary line switch I, primary master switch J, secondary master switch K, secondary relay equipment L and chain relays M.

The primary line switch H is the same line switch as is shown in Fig. 18.

The secondary line switch I is identical with the secondary line switch shown in Fig. 26.

The primary master switch J is similar to the master switch shown in Fig. 19. In this master switch the open main relay O is a slow acting relay, and as a result the holding circuit from the springs of the trip relay T goes direct to the locking magnet LM, thus the starting relay SR can be a single wound relay. At P is shown a slow acting "kick off" relay, which is usually 1,100 ohms in resistance. The supervisory relay X is here shown as a double wound relay, the right hand winding of which is low in resistance (fifteen one-hundredths of an ohm), so that the locking magnet may operate in series with it.

The secondary master switch K is mechanically the same as the master switch shown in Fig. 19. The familiar trip relay is shown at T, the open main relay at O, the locking magnet at LM, and the solenoid at SL.

In the secondary relay group L the function of the starting relay A is the same as that of relay SR in Fig. 19; the resistance of this relay is 1,300 ohms. The function of the stop relay B is to remove battery from the secondary master switch K when all the outgoing trunks from the secondary group are busy. Upon energizing it also closes the circuit of the kick off relay P, in each primary master switch associated with this group of secondaries. The resistance of this relay is 1,300 ohms. The supervisory relay C is similar to the supervisory relay X of the primary master switch J; the low resistance winding is, however, on the left hand end. The relay D is in series with the open main feed to the secondary line switches, the left-hand winding is 3,400 ohms and the right-hand winding 18 ohms in resistance. The trunk busying relay E is a slow acting relay of 3,410 ohms resistance; this relay is normally energized and only drops back when the starting relay A operates.

The chain relays M are ten in number, one being associated with each outgoing trunk from their secondary group.

Let us assume that a subscriber removes his receiver and that the primary line switch H plunges in. A circuit may now be traced from ground, bank contacts line switch H, low winding of the secondary line switch I, break springs secondary line switch, open main relay O of the secondary line switch, make contacts relay E, relay D, break springs open main relay O of the secondary master switch K, break springs stop relay B, low resistance winding of supervisory relay C to negative battery. Neither the secondary line switch nor the open main relay O will energize at this time, due to the resistance of relay D. The relay D will energize and the 3,400 ohm winding will be shunted, following which the secondary line switch I and the open main relay O will operate and the connection will be extended to the first selector. When the primary line switch H plunged in on this trunk, a ground was placed on the associated master switch bank contact, which caused the primary master switch J to seek an idle trunk.

When the secondary line switch plunges in a circuit may be traced from ground, bank contacts secondary line switch, master switch bank contact, starting relay A, to negative battery. The starting relay A will energize and cause the secondary master switch to seek an idle trunk. In addition the starting relay will open the circuit of the trunk busying relay E. The relay E, upon de-energizing, will remove open main from the open main lead to the secondary line switches, and will place ground thereon. This ground will feed back through the various secondary line switches to the master switch bank contacts associated with the trunks to this particular group of secondaries. If any primary master switch happens to be standing opposite one of these trunks it will be moved off; this is to insure that no primary line switch will plunge in on a trunk to a secondary while the master switch associated with that particular secondary is operating. The relay E is made slow acting so that its speed of de-energizing can be controlled. In some offices it is adjusted not to release unless the secondary master switch swings over at least three trunks. This saves considerable wear on the primary master switches, but makes it possible for a primary to plunge in on a secondary while the associated master switch is operating.

When the release relay R of the selector returns ground on the release trunk the circuit of the corresponding chain relay is closed. The chain relay energizes and closes its portion of the chain, and also places ground on the associated master switch bank contact. This arrangement is advantageous in that an outgoing trunk may be made busy by simply grounding the release trunk at the selector. Following which the attendant should step to the secondaries and operate the master switch, to insure that no secondary line switches are left standing opposite the trunk which has been made busy.

If all the outgoing trunks from the secondary group become busy a circuit may be traced from ground, through the make springs of each chain relay, stop relay B, to negative battery. The stop relay B, upon energizing, will open the battery feed to the secondary master switch K, thus causing the secondary master switch to cease hunting an idle trunk. No matter where the secondary switch comes to rest it will find the master switch bank contact grounded, and as a result the starting relay A will be held energized. As before, the trunk busying

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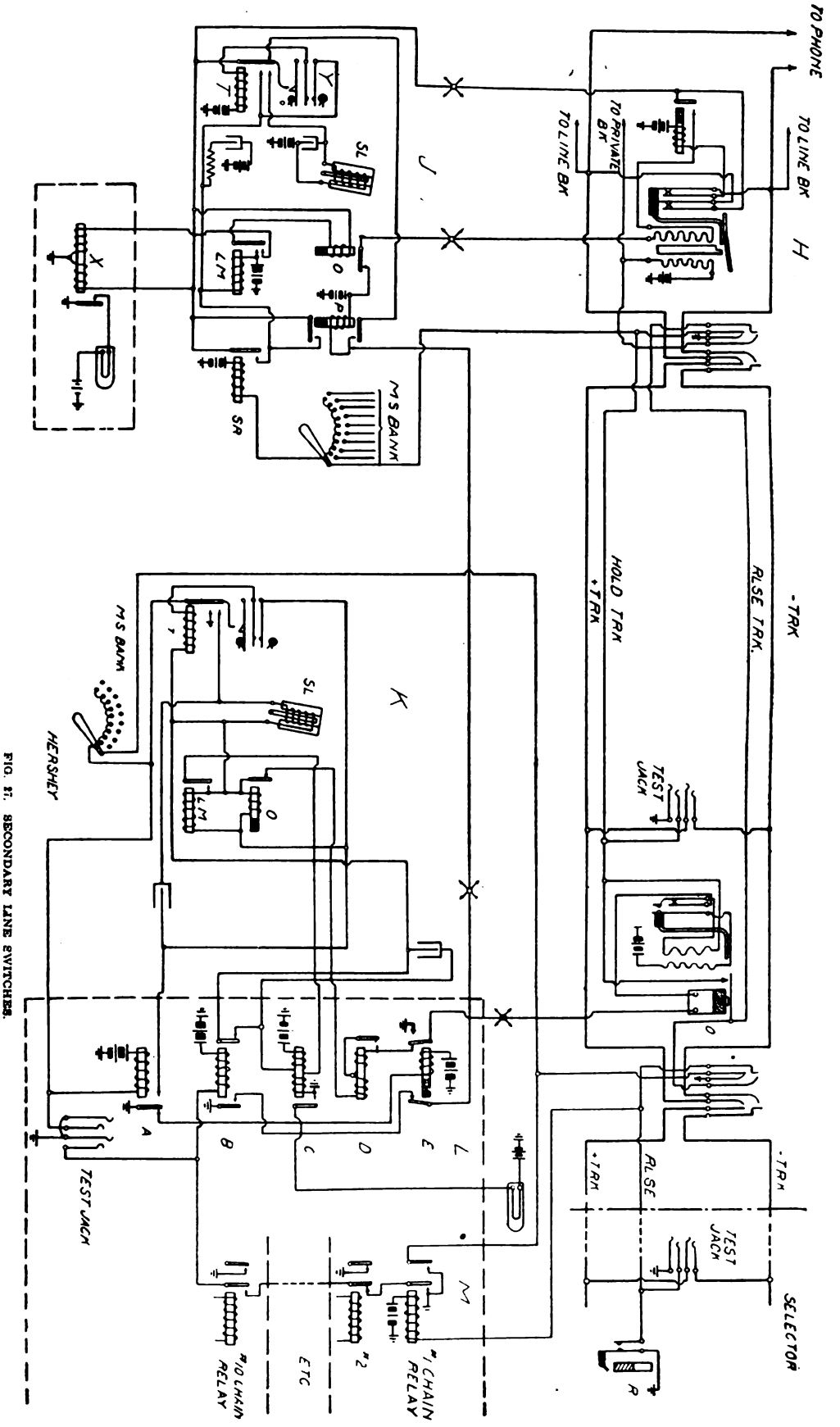

FIG. 11. SECONDARY LINE SWITCHES.

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relay E will de-energize and ground all the trunks leading into this group of secondaries. This busy condition is likely to last quite a while, so it is not sufficient to merely ground the contacts in the primary master switch banks which are associated with the trunks to this group of secondaries. For the reason that a primary may have plunged in on one of these trunks, and then released; but has not yet been picked up by its master switch. If this subscriber again removed his receiver he would plunge in on a trunk leading to a secondary line switch in the group whose outgoing trunks were all in use. Therefore, when a secondary group becomes busy it is necessary that all the primary master switches in the thousand be operated so as to pick up any line switch that happens to be standing opposite a trunk to the secondary group whose outgoing trunks are all in use.

When the stop relay B energizes, and before relay E de-energizes, a circuit may be traced from ground, make springs relay B, make springs relay E, to each primary master switch in the group. Continuing the circuit at primary master switch J, we find that it passes through the break springs of kick off relay P, relay P, to negative battery. The current flowing in the above traced circuit is of short duration, for the trunk busying relay E soon de-energizes after the start relay A opens its circuit. This impulse of current will, however, be sufficient to operate the various kick off relays, which, when once energized, form a locking circuit for themselves. In the case of master switch J this circuit may be traced from ground, supervisory relay X, break springs trip relay T, make springs relay P, relay P to negative battery. When the kick-off relay energizes it closes a circuit through the locking magnet LM which, upon energizing, removes the retaining arm, thus allowing the master switch to swing in front of trunk number one. When trunk number one is reached the springs Y are operated and a circuit is closed through the trip relay T, which operates in a manner with which we are familiar, and causes the master switch to swing in front of trunk number ten. When the trip relay energized the circuit of the kick-off relay was opened, the kick-off relay does not again energize when the trip relay is released, for its circuit is now open at the springs of trunk busying relay E. From the foregoing it will be seen that all the master switches in the thousand have made at least one sweep over the trunks, and thus all the idle line switches have been picked up.

When an outgoing secondary trunk becomes idle the associated chain relay will de-energize and open the circuit of the stop relay. The stop relay will de-energize and again place battery on the master switch K, which will immediately take up a position opposite the idle trunk. The starting relay will now de-energize and close the circuit of the trunk busying relay, which will energize and remove the busying ground from the various trunks, and at the same time place open main on the secondary line switches.

If open main battery were normally placed directly upon the secondary line switches, the starting relay SR in the primary master switches would be partially short circuited, and as a result, it would be difficult to adjust it to de-energize upon the first idle trunk. This theory will be explained in detail later. In order to assure the proper operation of the starting relays the open main battery is controlled by the relay D, which maintains 3,400 ohms in the open main circuit until such time as a primary line switch plunges in.

QUESTIONS

A. What would be the result if one of the chain relays failed to energize?
B. What would happen to the primary line switch if the relay D failed to energize promptly?
C. If the power board fuse for all secondary groups should blow what effect would it have on the primary master switches?
D. In view of the fact that the E relay controls the open main feed to the secondary line switches, why is it necessary to have an open main relay on the secondary master switch?

(To be continued)

BOOK REVIEWS

Smith and Campbell's Automatic Telephony

The second edition of Smith and Campbell's "Automatic Telephony" has just been placed on the market by the McGraw-Hill Book Company, New York. The first edition of this book was issued in 1914, while the present edition brings up-to-date all the developments in automatic telephony.

Prior to the year 1908, the use of automatic and semi-automatic telephone apparatus was confined almost entirely to the "Independent" telephone companies of the United States and America.

Since that year its adoption, first by the Governments of various Canadian cities and provinces, then by the Governments of Germany, Austria and France, and latterly by the Governments of England, Italy, Australia and New Zealand; and its introduction into Denmark, the Argentine Republic, Cuba and Hawaiian Islands, and the lands of the Far East, has created a world-wide interest in this system and a general demand among telephone engineers for a more extensive knowledge of it.

Radical changes have been made in revising this book from the first edition. As far as possible, only live matter has been retained, live subjects introduced, and old things—recast into such form as will be more readily understood.

There are seventeen chapters, all of which give full explanation of the subjects treated. The book consists of 430 pages, measuring 6 inches wide by 9¼ inches in length. The book is copiously illustrated.

The price of this valuable work is $5.00 and copies may be obtained by addressing orders and making remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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Origin and Development of Radio Service in America

In our issue dated February 1st of this year we printed an article under the title of "Origin and Development of Radio Service in America," prepared by Rear Admiral W. H. G. Bullard, of the United States Navy, which explained the manner that brought about the formation of the Radio Corporation of America, which acquired the property of the Marconi Wireless Telegraph Company of America.

Further statements of officials of the Radio Corporation and others in regard to that organization will prove interesting at this time when so much is being printed respecting radio telegraphy and telephony.

When title was taken by the Radio Corporation from the American-Marconi Company to its stations and title to Tuckerton was taken from the French, the Radio Corporation came into possession of all the high-powered stations in the United States in private hands. The problem was then one of developing these facilities as quickly as possible for communications. The work of the American Telephone and Telegraph Company and of the Western Electric Company in the radio field, and particularly in the application of the radio to communications, was conspicuous. It seemed wise at that time if possible to interest this great American concern which had so much experience in the communication field in the Radio Corporation of America.

This was done through a general exchange of licenses and definition of fields—broadly, the American Telephone and Telegraph Company taking licenses in the field of radio telephony in so far as radio telephony should be used for tolls or as a part of a toll system, the Radio Corporation of America having the licenses for radio telegraph, both for domestic business and overseas, and for the radio telephone overseas business and on ships. The Radio Corporation also had the radio rights, broadly speaking, for amateur uses and other private uses as distinguished from their use on a public-tolls system. The radio patents applicable to wires in the telephone field went to the telephone company.

When the arrangement was made for this cooperation between the General Electric Company and the American Telephone and Telegraph Company, a public statement was then issued substantially like this:

"The General Electric Company and the American Telephone and Telegraph Company have entered into a contract whereby the patents and scientific developments of both companies, through an exchange of licenses, are made available to each. The world-wide system of the Radio Corporation and the universal system of the Bell system was thus brought into an harmonious relation which will facilitate the use by the public of the present telegraph facilities of the Radio Corporation, and, as the art advances, will enable the American Telephone and Telegraph Company to extend its telephone service to ships at sea and to foreign countries. The American Telephone and Telegraph Company, in order to better carry out the purpose of the agreement with the General Electric Company to co-operate in advancing the art of radio transmission and communication, has purchased a minority interest in the Radio Corporation, so that the Radio Corporation today is dominated, and will be, by American interests, and its purpose is to develop American radio communication, not only through the construction and operation of stations in the United States, but through the construction and operation of stations in South America and elsewhere in the world where business is large enough to demand it and the rights therefor may be obtained."

In connection with the arrangement to interest the telephone company in the Radio Corporation, a so-called traffic arrangement was made between the Radio Corporation of America and the American Telephone and Telegraph Company. The purpose of this contract was to provide, if satisfactory arrangements could not be made with the land wire telegraph companies, for the collection and distribution of overseas radio messages over the circuits of the telephone company.

The term of this contract was for substantially ten years. Broadly, it provides that the radio company may attach its wires to the poles of the telephone company for the purpose of connecting its sending and receiving stations with each other and for the purpose of connecting them with any central office or offices of the Radio Corporation. This part of the contract merely enables the Radio Corporation better to handle its sending and receiving stations. It does not provide, of course, for the distribution and collection of messages.

The provisions of the contract with the telephone company for the distribution and collection of messages, broadly, provides that the telephone company will receive at any central point messages which may have been collected by the Radio Corporation, and will transmit those messages over its wires to its central office, from which they may be transmitted to the central sending station of the Radio Corporation. And likewise messages received by the Radio Corporation from overseas will be transmitted by the telephone company over its wires to some central point—for example, like from New York to Chicago—there to be distributed to the addressees of the messages by the Radio Corporation.

The contract is not considered either by the Radio Corporation or the telephone company as providing the best means for the collection and distribution of radio overseas messages. The contract merely provides facilities by which such messages may be distributed and collected, regardless of the attitude of the domestic land wire telegraph companies.

The Radio Corporation of America is now extensively engaged in the business of international

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communication as distinct from its other activities in the fields of marine radio communication and the leasing or sale of radio apparatus and radio stations, ranging in size from small sets for marine use and short-distance communication to high-power stations for international or long-distance radio communication.

Since March 1st the corporation has opened and successfully operated five international duplex radio circuits to the following countries:

1. March 1, Great Britain, competing with the cable services of the Western Union and Commercial Cable Company.
2. March 1, Hawaii and Japan, competing with the Commercial Pacific Cable Company.
3. May 17, Scandinavia, the only direct service to Scandinavia; competing with various cable services via London.
4. August 1, Germany, the only direct service to Germany; competing with cable services via England and France.
5. December 15, France, competing with the cable service of the French Cable Company, also the services of the Western Union and the Commercial Cable Company.

These combined radio services are now handling considerably more than 1,000,000 paid words per month.

To successfully operate an international radio service it is obvious that two high-power stations of approximately equal ability are essential. The radio stations, being located on foreign territory, are usually owned and operated by foreign Governments or by foreign companies licensed by their Governments to conduct international radio service. It has therefore been necessary for the Radio Corporation of America to make contracts, or working agreements, with the foreign Governments or foreign operating companies.

The agreement for the operation of a radio service with Great Britain was made with the Marconi's Wireless Telegraph Company, Ltd. The only stations capable of international radio communication from Great Britain are owned and operated by the English company just referred to. The English company also operates a direct transatlantic wireless service from Great Britain to Canada. The term of this agreement continues until January 1, 1945, and thereafter until canceled by either party. The agreement also provides that every message received by the Marconi's Wireless Telegraph Company, Ltd., destined to or through the United States shall be forwarded by them to the stations of the Radio Corporation. All tolls or receipts which accrue from the operation of this radio circuit are added together and the same is divided equally between the two operating companies. It is also stipulated that the service shall be conducted, accounted for, and settled according to the rules and regulations of the international telegraph convention, which provides for a quarterly settlement of accounts.

The radio service with Japan is founded upon a contract with the Imperial Japanese Government, which Government owns and operates the radio station in Japan with which the Radio Corporation of America is in direct communication. This contract was made in 1916 for a period of five years to be continued thereafter unless six months' notice be given by one party or the other of a desire to terminate the same, but owing to the war the service was actually suspended until March 1, 1920. This agreement provides that radio traffic should not be higher than two-thirds of the rates prevailing via the submarine cable route. It also provides that if messages are transmitted directly from Japan to California, and vice versa, without being relayed at Hawaii, the tolls on such messages should be divided equally between the Imperial Japanese Government and the Radio Corporation of America. If, however, messages are relayed at Hawaii, the division of tolls shall be two-thirds to the Radio Corporation and one-third to the Imperial Japanese Government. The normal method of handling Japanese traffic is to relay it at Hawaii. The agreement also provides that messages to the United States Government or the Imperial Japanese Government may be sent via the radio service at one-half the charge made for ordinary public messages. The working arrangements and settlement of accounts shall be according to the provisions of the international telegraph convention.

The Scandinavian service is conducted with the Government of Norway, which Government owns and operates the high-power radio station with which the Radio Corporation of America is in direct radio communication. The duration of this agreement is twenty-five years, with the privilege of renewal for a further period. The gross receipts derived from the service conducted by the Norwegian Government and the Radio Corporation of America are pooled, the Government taking one-half of such pooled receipts and the Radio Corporation taking the other half. This agreement also provides that the service rendered shall comply with the terms of the international telegraph convention, which includes the quarterly settlement of accounts between the two operating administrations.

The agreement with the German Government provides two periods of operation. The first a provisional arrangement which will cease as soon as the technical state of war between the United States and Germany is declared at an end. During this provisional period the Radio Corporation operated its service with the German Government upon the same terms and conditions previously in effect between the United States Naval Communication Service and the German Government. As soon as a state of peace is declared the German Government agrees to formally admit the Radio Corporation of America to radio communication with Germany for a period of ten years, commencing on the day on which the state of war shall be declared ended, and such agreement shall run automatically for additional periods of five years, unless three months' notice shall be given by one party or the other.

This formal agreement provides the gross receipts

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collected for the radio service shall be summed up and divided equally between the German Government and the Radio Corporation, and the settlement of accounts and payment of balances shall take place in accordance with the regulations of the international telegraph convention.

The contract for radio service with France was made with the Compagnie Generale de Telegraphe sans Fil. The French company has been licensed by the French Government to conduct international radio communication with the United States, and our agreement with the French company will remain in force until November 1, 1945, and shall be renewed for periods of five years unless previous notice be given by one party or the other. In the French agreement the gross receipts are not pooled and divided equally. The arrangement provides that the transmitting station shall retain the tolls, the theory being that traffic will normally be equal in both directions. The agreement also provides that the service shall be conducted in accordance with the regulations of the international convention.

The central telegraph office of the Radio Corporation of America is located in the heart of the financial district of New York City, at 64 Broad Street. In order to more efficiently serve its patrons in the metropolis, it has opened other receiving and delivery offices located as follows: 233 Broadway, 933 Broadway (Twenty-second Street), and 500 Fifth Avenue (Forty-second Street and Fifth Avenue). These offices are all connected with the main telegraph office by special leased telegraph circuits, and the central office is again connected by a number of leased telegraph circuits to each of the high-power stations on the Atlantic seaboard. To collect and deliver radiograms in the city of New York requires, at the present time, a force of approximately fifty uniformed messengers.

(To be continued)

Old Time Reminiscences of Henry E. Hutchens, of Washington, D. C.

There is considerable interesting telegraphic experiences attached to the application blanks of those who become members of the Old Time Telegraphers' and Historical Association. The one prepared by Henry E. Hutchens, of Washington, D. C., recently filed with the secretary, will no doubt be read with interest. He says:

"In filling out the spaces in the Old Timers' application form, my mind reverted to old days, the associations and incidents of those days, and I dreamed them over again for the first time in years.

Commencing the study of the dot and the dash on October 25th, and taking charge of the office in December was going some. It was brought about by the serious illness of the wife of J. D. Westervelt, manager of the Rutledge, Ga., office, where I was studying. Operators were scarce in those days, and J. A. Brenner, superintendent, at Augusta, Ga., hearing of the plug in the Rutledge office, directed Mr. Westervelt to put him in charge and go home to his wife, who was seriously sick.

At the same time, Mr. Brenner, who was in later years one of my most treasured friends, sent out an order in which he recited the facts, the necessity for putting an incompetent in the Rutledge office and directed them to have patience.

They were generally so, and I tried them sorely. Well do I remember my first commercial message received, a long fifty-word message of sympathy from Mr. Westervelt's brother-in-law of Beaufort, N. C., and in which the following language occurred:

"God grant that a favorable change may take place."

Good old Tom Boyle, of the Augusta office, was the unlucky sender. I received it word for word absolutely correct, except:

On the old New Orleans receiving blanks a plug could not put fifty words to a page and I had to turn over, the bottom line on the first page reading: "God grant that a favor." The top line on the other side read: "Able change may take place."

Tom wound it up "55 D H operator." I counted it and told him there were fifty-six words. He lettered and I lettered, but no result. Tom finally told me in emphatic language to deliver the message as I had it, which I did, and was surprised when Mr. Westervelt said it was all right and the check was O. K. I kept the original and have it now, and it was years afterward before it dawned on me "favorable" was one word.

This forced service, however, developed me more rapidly than would have been the case otherwise, and I was subbing regularly from January to June, 1872.

Another incident of this period occurs to me. Operator Ogden, of the Augusta office, gave me a severe blow-out on my nervous sending and it cut rather deeply. Years after, when Mr. Ogden was working in New York, I had the pleasure of sending him some Morse that I was sure he could not criticize, and when I had finished I asked him if my sending reminded him of "Peach Stones." He had, of course, forgotten the incident, but I was repaid.

June 22nd, 1872, Superintendent J. A. Brenner wired me to meet him at Barnett, Ga., for my first regular job. I have the message now. I reported on time and met Mr. Brenner and J. M. Crawley, manager of the Augusta office there, and the Barnett office was opened that day. On January 1st, 1873, I opened the Thomson, Ga., office.

On February 22nd, 1876, Superintendent J. A. Brenner personally called me up while I was subbing for Cooney Hemphill, later superintendent of the Georgia Railroad, and said he wanted me to go to Savannah, Ga., and sub for Henry Rady. Henry was the step-son of Superintendent Dowell of Richmond, and had been called to attend the latter's funeral. Would I go? Sure! I reported to Henry Griffith, the manager of the Savannah office, the

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next morning, and as Henry Rady was transferred to Richmond after the funeral, I was made a regular in the Savannah office, where I remained for some years. The force at this time was: Henry Griffith, manager; B. F. Dillon, chief operator; Alex Harkness, R. G. Callum, George C. Harris and the writer, as operators.

During my stay in the Savannah office I had associated with me at various times, in addition to those named, W. H. Turner, Ben Roos, William Fraser, Alex K. Sinnott, J. S. W. Phillips, Mike Dundon, Harry Zeigler, Jack Ingle, C. J. Mapp, Homer K. Hibbetts, Tim Minehan, George W. Bell, Wm. Fleming, Dan McLoraine, Eddie King, Mona H. Harris, N. H. Monck, Gus Haight and a number of others whose names do not occur to me now.

"Bogy," H. A. Bogardus, used to call on us regularly on his way to Jacksonville to help John Coyne out for the winter season.

I served through the yellow fever epidemic of 1876, and although there were several who did not have the fever, I was the only one that worked every day and night through that period.

On the day the epidemic was declared at an end and refugees were told they could return with safety, Mr. Brenner, then in Tallahassee, Fla., where he had gone on account of the great rush of business following the Hayes and Tilden Presidential election, wired for Bob Callum, then in Greensboro, N. C., where he had refuged from the fever, and myself, to report to him at once. I reached Tallahassee on the 17th and Bob the following day. I was put in charge and Bob was the operator. Mr. Brenner had been in charge for a day or two, the rush having swamped the three or four. Among the operators there I recall C. P. Brush, Mr. Goodwyn and G. D. Mills.

We had one local railroad wire, and on this wire Bob and I handled, as well as I recall it, over $26,000 worth of business in about forty-one days, the error sheets for that period amounting to less than $10, and not a cent did I put up in settlement.

During this time I averaged not quite twenty hours per day of service, and yet I was happy and well.

When the Supreme Court of Florida rendered their famous decision on the celebrated election mandamus case, this decision amounting to many thousand words, was sent by Mr. Callum and myself, each relieving the other every eight hundred to a thousand words. We had the same touch and were classed as among the speed artists of that day. John Miller, of Lake City, the Cuban relay office, received it and General Superintendent N. DeBree, of the International Ocean Telegraph Company, timed it, saying it was the record sending of that volume by one man. I happened to close it up and got the credit for the work, but later on I disclosed the fact that Callum and myself were on the job.

Immediately on my return to Savannah after the rush was over, I was arrested and taken to Washington, D. C., as a witness before a committee of the House of Representatives. The evidence wanted of me was with reference to an alleged telegram from Zach Chandler to Governor Stearns of Florida relative to troops. This examination was later burlesqued by Bill Benton and published in "Lightning Flashes and Electric Dashes," as the evidence of Ben Bilton.

A congressional sub-committee had gone to Tallahassee to get the telegrams and look them over, but I had been put wise to this, and when the deputy sergeant-at-arms was at the front door of my office to serve the papers on me, I jumped out of the rear window with the entire files and sent them to the New York office, holding today the Southern Express receipt for the package. The congressional committee was angry, hence my arrest. On reaching Washington, I was met at the Willard Hotel the next morning by Colonel Whitney, manager of the Washington Western Union office, then located at the corner of Fourteenth and Pennsylvania Avenues, diagonally across from the famous Morse Elm tree.

Colonel Whitney took me in another room and introduced me to William Orton, then president of the company, and to Clarence H. Carey, the attorney.

When I reached the Capitol later in the day, I found there ahead of me Mr. Orton and the entire board of directors, headed by William H. Vanderbilt. These men were all prominent in world affairs, and I did not feel so very much embarrassed by being under arrest.

After a few weeks of drawing a per diem from the Government, John Van Horne, the vice-president of the company, secured my release that I might return to Savannah, where I was badly needed.

In September, 1882, I resigned commercial and returned to railroad work, it offering greater prospects.

In June, 1885, I gave up telegraphing and have been continuously employed in either transportation, traffic or maintenance work. I have been with the Southern Railway System for twenty-five years as an officer in the transportation department.

During my service with the Western Union I was more or less intimately associated with the following old timers: James M. Stephens and A. H. Holcombe, of Atlanta, Ga.; J. M. Crowley, John W. Brown, Asbury and John Potter, Ducky Seward, A. H. Spracklen, Joseph Laney, Joseph Hurley, Thomas M. Yarborough, Thomas A. Boyle and William Benton, Augusta, Ga.; J. D. Easterlin, Patrick Ryan, Tony Canova, Charleston, S. C.; John Coyne and Frank Hernandez, Jacksonville, Fla.; Julien Soule, Daniel Crowley, Harry Stoy and John Miller, of Lake City, Fla.

In the New York office I worked with and became very fond of Gus Coleman, J. B. Sabine, R. G. Stephenson, J. B. Gaynor and others.

While in the Savannah office I had the pleasure of assisting John Brown and B. F. Dillon in put-

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ting up the first duplex and quadruplex and was the first operator assigned to work them. I mean, of course, the first of these instruments used in Savannah.

I also assisted in putting up and testing out the first telephone brought to Savannah. This was in 1877.

Mr. Hutchens refers to the record in "Lightning Flashes and Electric Dashes" of the congressional investigation of the Hayes-Tilden Presidential controversy. We quote from that work as follows:

The reader will only need to recall the action of the House of Representatives during the late Presidential contest to appreciate the following:

Ben Bilton sworn.

Chairman: What is your name?

Witness: Bilton.

Stenographer: Your initials?

Witness: I sign "F."

Chairman: What is your name?

Witness: Oh! Ben.

Chairman: How long have you operated in Florida, Mr. Bilton?

Witness: Well, first in the spring of 1855 me and Schemerhorn went from——

Chairman: We don't want to hear about Schemerhorn, or '55, either. Did you work there in November, '76?

Witness: Yes, sir; I subbed in Tallahassee that month.

Chairman: While subbing there, did you see or hear of a message from Chandler to Stearns, mentioning money and troops?

Witness: Yes, sir; I received it myself, and asked about those two words.

Chairman: Asked who?

Witness: Oh, you don't "13"; I mean I broke on "money." It's not unusual for operators to do that.

Chairman: Was this message delivered promptly?

Witness: I don't know; I think the money and soldiers were.

Republican Member: Please confine yourself to answering questions. Do you know Mr. Stearns?

Witness: Stearns, the duplex worker?

Members together: No; Governor Stearns of Florida?

Witness: Not intimately.

Republican Member: How long can an operator remember a message?

Witness: That varies according to circumstances. Some remember a "bulled" message eighteen months, when they could not repeat an ordinary message a day old.

Chairman: How long does the company preserve the originals?

Witness: I don't know; but judging from the date of changed checks and other errors, I should say they preserved them forever.

Chairman: That will do.

Republican Member: One moment, Mr. Bilton. What influenced you to come so far to give this testimony?

Witness: The eloquence of the deputy sergeant-at-arms and a morbid desire to scoop in that mileage business. But I didn't count on such a "roast" as this, and I am glad that it is at last over.

Chairman. Bring in Mr. Orton again.

When leaving the room, Mr. Bilton completely put his foot in it, by asking the door-keeper the way to the "bar" of the House.

Radio Signals From Mars

If the Martians are still sitting on the banks of their canals waiting to get into wireless communication with earth, they will have to be patient until the whole controversy of interplanetary signalling has been settled by American and European scientists.

The recent announcement by J. H. C. Macbeth, London manager of the Marconi Wireless Telegraph Company, Ltd., that Marconi was convinced he had intercepted wireless messages from Mars, served only to stir up once more the dispute that aroused the scientific world two years ago, when Signor Marconi made public the results of his experiments in the Mediterranean on his yacht *Electra*. Mr. Macbeth's interest in the affair was solely from the point of a telegraphic code expert, who, should communication ever be established between Earth and Mars, would be prepared to surmount the language barrier by the use of telegraphic transmission of pictures accompanied by a simple code.

Some experts expressed the belief that the mysterious signals of extraordinary wave length picked up by Signor Marconi were radio "undertones," caused by interference by high-powered radio stations. This belief was shared by Nikola Tesla, who said he first noticed this phenomenon as early as 1907.

"When a wireless station sends out a message," said Mr. Tesla, "it also sends out undertone to the message. These undertones interfere with ordinary wave lengths, and by this interference waves of great length are sent out. Since 1907 I have found these long wave undertones increasing with the establishment of high powered stations throughout the world."

One cause of these undertone interferences was said by wireless operators to come from the Schenectady plant of the General Electric Company, where experiments are being conducted at a high-powered radio plant.

Telegraph and Telephone Life Insurance Ass'n

Assessment Nos. 705 and 706 have been levied by the Telegraph and Telephone Life Insurance Association, New York, to meet the claims arising from the deaths of: William J. Francis, Atlanta, Ga.; Neil Glass, Roswell, N. M.; Austin L. Pollard, St. Louis, Mo.; John S. Cooper, Salt Lake City, Utah; Felix A. Dowling, East St. Louis, Ill.; Richard Hopkins, New York; Jenkin S. Evans, Grand Junction, Colo., and Edwin N. Armstrong, Peoria, Ill.

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A Peculiar Electrostatic Phenomenon

A lecture describing peculiar electrostatic phenomenon was given at an ordinary meeting of the Institution of Electrical Engineers by Messrs. A. Johnsen and K. Rahbek on May 26th. The lecturers described apparatus developed by them from experiments commenced in 1917 on the properties of semi-conducting materials. By placing a slab of such a material between the plates of a condenser—one plate being in the form of a disc 2 inches in diameter suspended from the arm of a balance—it was shown that when a potential of 400 volts was applied to the plates, it required a weight of over a kilogram to pull the disc away from the material. The current flowing through the apparatus was extremely minute.

The effect appears to be due to the formation of a layer of ions on the surface of the semi-conducting material, so that the small distance separating this layer from the metal disc resting on it accounts for the large attracting force, says the "Radio Review," London. If the semi-conductor is made up in the form of a disc or cylinder on the surface of which one metal electrode rests, the attractive force called into play when a potential is applied gives rise to an increased friction between the metal and the material if the latter is maintained in rotation by a suitable motor.

Applications of this apparatus to "no-volt" relays, to telegraphic recorders and to loud-speaking telephones were described. A demonstration was given of a violin used as a loud speaker by attaching to it an agate cylinder round which was wrapped a metal band attached to the body of the violin, the reproduction of both music and speech being very clear and loud. Many materials have the property of showing these effects, and in particular lithographic stone, slate, and agate may be mentioned.

Edward C. Newton

Edward C. Newton of Little Rock, Ark., who received the historical message from Colonel Robert C. Clowry of New York, over a Western Union wire on Sunday, July 24th, as recorded on page 349, August 1st issue, has the distinction of having spent almost his entire business life in that city.

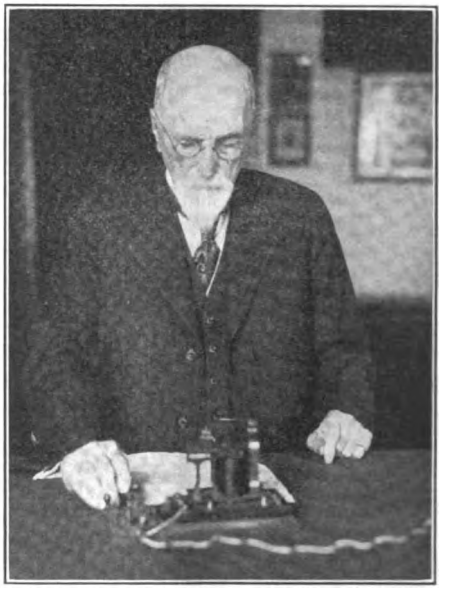
Mr. Newton was born in Missouri May 4th, 1844, and moved to Arkansas in 1850. He learned telegraphy in 1862, during the Civil War, and was an operator in the telegraph office at Little Rock, Ark., for a few months in that year. He then was sent South to work at offices on the line of the Arkansas Telegraph Company, running out of Little Rock. After the Federal forces captured Little Rock in September, 1863, causing the Confederate forces to retreat, that company operated a line betwen Camden, Ark., via Shreveport, La., to Crockett, Texas, and until the close of the war.

Mr. Newton was the operator in the office of the Arkansas Telegraph Company at Shreveport when the Confederate forces, under the command of General E. Kirby Smith, surrendered to the Federal forces in June, 1865, being the last body of Confederates to surrender, and which closed the war.

Mr. Newton then returned to Little Rock in July, 1865, and found that the wires running out of Little Rock were still under the control of the United States Military Telegraph, of which Colonel R. C. Clowry was the superintendent, and who, notwithstanding his war antecedents, gave Mr. Newton a position as operator in the Little Rock office on August 1st, 1865. He held that position until February, 1866, six months, or until the United States Military Telegraph Wires were transferred to the telegraph company, when he was made manager of the Little Rock office and was in that position continuously for forty-six years, until retired by the Western Union Telegraph Company in 1912. He was offered promotions in the telegraph service at different times, but preferred to remain in Little Rock on account of family and business relations.

After his long term of fifty years in the telegraph service he is now resting from his labors in the evening of his life at his home in Little Rock.

The engraving herewith pictures Colonel Robert C. Clowry at the New York end of the Little Rock



COLONEL ROBERT C. CLOWRY, NEW YORK

wire, sending his historical message to Colonel Newton at Little Rock, which reads as follows:

New York, July 24th, 1921.

E. C. Newton,

Little Rock, Ark.

"It's a long time from 1861 to 1921, since we were both young fellows and worked the key, you under the 'Bonnie Blue Flag with a single star,' and I under the 'Stars and Stripes.' We both did our duty and were spared to see a gloriously united country. Some day the Great Commander will be calling us to another country, where many an old comrade will be in waiting to extend the familiar '73.'

ROBERT C. CLOWRY."

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY

By Louis Casper

Lesson 35

In Lesson 34, distortion of signals passing over a line wire due to the effect of induction coming from neighboring wires carrying either telegraph or power currents, was particularly exemplified.

There are, however, other causes that may affect the sine wave characteristic of such signals. These causes deal mainly with the adjustments and arrangement of apparatus, either duplex or quadruplex types, both in the transmission and reception of signals, more particularly the former.

It is quite obvious that the manner of impressing initially a signal upon the line should be accomplished by the best means possible within the limits of the practical operation of the apparatus. Three important factors are to be considered in this particular. First, the type and adjustment of apparatus used for the transmission of signals should be such that in the process of reversing polarity the point of contact between the armature of the polechanger connected to the line and the connection leading to the motor generator or battery will be positively made and the travel for this armature in order to reverse the current from positive to negative or vice versa will be accomplished with the greatest speed possible. Second, the conducting path or *conductance* to the point where the path divides between the line and the artificial line circuit should be as high a value as is consistent with safety from the possibility of sparking points or "blow outs." Third, the equality of potentials originating from motor generators or batteries should be rigidly maintained.

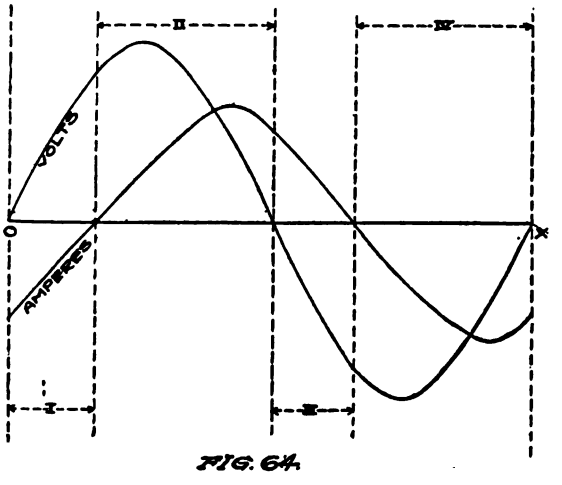

FIG. 64.

If these three factors are maintained to a high degree of efficiency, the tendency of the operating current will be to preserve a closer phase relation with the e.m.f. that produces it. If, on the other hand, the method of transmission is not so efficient, the current will tend to lag behind the impressed e.m.f. and the resultant operating current, or, as it is designated, the power curve would present a characteristic of somewhat narrowed dimensions.

This can be proven; and before going into further detail in the discussion of the three factors mentioned, we will refer again to Fig. 64, which appeared in Lesson 25 and is herewith reproduced.

It will be seen that the current and electromotive force curves are divided by the dotted vertical lines crossing the zero line at the intersections of the curves. Within the space I, e.m.f. *ordinates above the line, which are positive are multiplied by current ordinates below it, which are negative. By algebraic calculation this result is negative. Therefore, the new or resultant curve of the impressed e.m.f. and the current for this division is below the line and negative in sign. Within the space II, positive e.m.f. ordinates are multiplied by positive current ordinates, giving a positive resultant curve or one above the line. Within the space III, positive current ordinates are multiplied by negative e.m.f. ordinates, bringing the new combined resultant curve below the line. Within the space IV, both current and e.m.f. ordinates are negative. By algebra negative multiplied by negative gives a positive quantity; therefore, the combined resultant curve is above the line in this section of the sine waves as shown. The result of this is indicated in Fig. 99 and illustrates the narrowing down process of the resultant or power curve due to the impressed e.m.f. and current being somewhat out of phase with each other. If both e.m.f. and current curves were exactly in phase, which rarely happens, the resultant power curve would also be in phase with the former two waves, and would present the same characteristics.

It will thus be seen that if an alternating or reversing electromotive force is multiplied by an alternating current, a product greatly differing in form and value from the additive or compounded result is obtained. This product, as already intimated, is a curve of power, and in text-books is indicated as the volt-ampere or the watt. The Fig. 99 shows a curve of electromotive force in heavy line and the current in light line. Multiplying their amplitudes together in the manner shown, new amplitudes are obtained that results in the curve drawn in dotted line, which is the power curve, and is the actual current that transmits the signals over the wire.

Polechangers

The object of the polechanger, as its name indicates, is to reverse the direction of the current as may be required for sending signals. As already stated, the interval during which the polechanger

*For the definition of the term "ordinates" and in further reference to the Sine waves as shown in Fig. 64, see Lesson 25, in the issue of April 16th.

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armature passes from one contact to the other shall be as brief as possible. It is therefore desirable, in addition to making the space through which the armature travels as small as is practicable, to have the speed of such travel very high.

Polechangers are of many and varied types, and nearly all designed to meet the requirements named.

The principal types of polechangers in which we may be interested are the hand-controlled instrument, the polarized repeater relay, the tape-con-

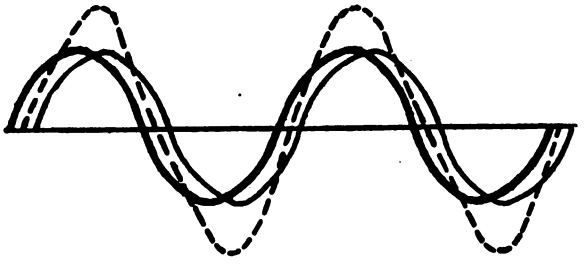

FIG. 99

trolled automatic transmitter, and the rotary distributor which initially transmits alternating pulses to the line directly. These latter signals, however, are in turn designated or selected by a tape controlled transmitting unit, as in the Western Union Multiplex and Morkrum apparatus.

The three first-named type polechangers impress current upon the circuit by means of direct contact points which connect the former to the latter. The manner in which these contacts are made are quite important in the endeavor to obtain at the outset a substantial sine wave current curve. By referring to Fig. 100 we find several methods of making contact between the armature and the contact points at either side of the same. Some of these, as shown, are not uncommon in actual practice. In Fig. 100 at *a* we find a case of bad alignment. This is gener-

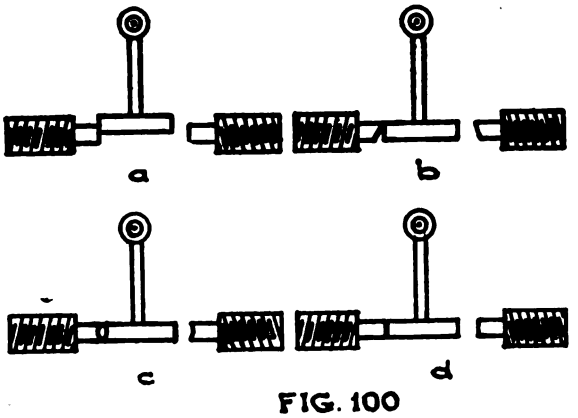

FIG. 100

ally due to unequal wear of the material of one of the contact points. The tendency of the armature in this case is to strike the edge of the point and, therefore, actual contact is made on a small surface area. This results in the development of an abnormal resistance and has the effect of narrowing the initial current rise and giving the signal a bad start. In *b* of the same figure, the points are in alignment, but contact is only made at one edge of the point. This is generally due to filing or burnishing the points to an incorrect angle. It must be borne in mind that the swing of the armature is axial, not reciprocating, hence a certain allowance should be made for the very slight angular plane of contact thus created. This is apparently a small matter, but will often restrict the area of contact surface, while to the casual eye the contact points would appear in perfect alignment. The next illustration, *c*, of Fig. 100 shows points well aligned, but contact only made on the rims of the points due to a hollow center in both contacting numbers. Contacts in this condition cause arcing, sometimes quite severely, and then again so slight as to manifest itself upon the line as a slight hit or "scrape." Since most of these contact points are made of platinum alloy, the high cost of the same preclude considerable filing. The writer found that owing to the ductility of the metal the point can be rubbed smooth on a piece of steel with a minimum loss of metal. The contact points shown at *d* are in perfect alignment and the entire cross-section surface of the same fully utilized. In this manner the current is not restricted in its rise insofar as polechanger contacts are concerned, and thus gives the signal its proper initial impetus.

(To be continued)

New Edition of Beginner's Manual of Submarine Cable Testing and Working, by G. M. Baines, Now Ready

Beginner's Manual of Submarine Cable Testing and Working, by G. M. Baines, has been thoroughly revised by its author and it was issued in fourth edition form on June 1st. The book is primarily for students in submarine telegraphy. All of the subjects on submarine telegraphy demanding attention have been brought within the scope of this volume, and have been dealt with, if not exhaustively at least at sufficient length to enable an intelligible idea to be obtained of them, which will admit of wider extension later. The book measures 5½ inches wide by 8½ inches long and contains 174 pages fully illustrated. The price of the work is $4.50 per copy, and it may be obtained at the office of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

A man going into a drug store went up to the clerk and asked for some stamps. The clerk told him the stamp machine was up in front of the store.

It happened that the stamp machine and a public pay station telephone were on the same counter. The gentleman went up to the telephone, took the receiver down, dropped five cents in the slot and very politely said:

"Two two's, please."

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New Western Union Offices at Salt Lake City, Utah

By A. Plausics, Jr.

From occupancy of a corner in a small adobe house with one employee who acted as manager, operator, janitor and sometimes messenger, to three spacious floors in the new Clift Building housing three hundred and twenty employees, is the story of telegraph growth and progress at Salt Lake City. The growth took place during the period of sixty years.

The Clift Building, situated at Third South and Main Streets, is a modern eight-story concrete office building. The Western Union Telegraph Company occupies the entire eighth floor, part of the seventh and main floors and all of the basement.

The commercial department is located on the main floor and occupies 3500 square feet of floor space. The main receiving office is a large, commodious room, well equipped with heavy oak furniture and glass top counters. The main entrance faces Main Street and a special side entrance for the use of messengers is provided on Third South Street. Fourteen call circuit registers and a call circuit switchboard are installed on this floor. A tube system connects the commercial department with the traffic.

The operating or traffic department occupies the entire eighth floor, which covers an area of 7800 square feet of floor space. The old method of carrying messages by boys and girls on roller skates or by Lamson lines, has been abandoned in favor of message-carrying belt conveyors. A continuously running canvas belt passes in front of each operator. As the operator takes a message they drop it on this belt, which takes it to a distributing center. At the distributing center girls sort the messages and put them on other belts which lead to drops. Boys pick up the messages and distribute them to the wires near these drops.

On this floor there are four Morse operating tables seating a maximum of forty-three Morse operators and three Multiplex tables seating a total of fourteen Multiplex operators.

The telegraph switchboard and distributing frame are located on this floor. Seventy-five wires, reaching all parts of the country, are operated out of the Salt Lake City office.

Twelve motor generators and a power panel are located here, furnishing potentials of 110, 160 and 240 volts, positive and negative.

Motor blowers, rotary repeaters, universal repeaters, time service, tubes to the bookkeeping, commercial and branch offices are located on the eighth floor.

The telephone department, where twenty girls are occupied receiving and telephoning messages for customers within the city or to Ogden, is located on the eighth floor. The telephone room is partitioned off from the rest of the departments and connected with the distributing center by belt conveyors.

The bookkeeping department, men's locker room and Morse and Multiplex school occupy the rest of the eighth floor.

Twenty-five hundred square feet of floor space on the seventh floor is occupied by the telegraph company, containing the offices of the district commercial superintendent, the women's rest room and the hospital room. The rest room is a large, airy place equipped with comfortable chairs, lounges, a piano, a phonograph, current newspapers and magazines and other conveniences.

In the basement, filing equipment, messengers' shower baths and a 50 K-V-A kerosene-gasoline emergency power plant are installed. This power plant is run periodically to insure its being constantly in good condition and ready to use in case of power failure.

Philadelphia

Philadelphia was represented at the Division Meeting of the Western Union Employees' Association, which was held in Baltimore early in August, by Lewis Derrick, of the plant department, and Mrs. Clara M. Hart, of the traffic department. Mrs. Hart was the only female representative at the gathering. Because of her well-known activities on all committee work pertaining to the telegrapher, she was appointed to several important sub-committees.

The Entertainment Committee of the Electrical Aid Society held a meeting at Belmont Mansion, Fairmount Park, August 16th, when all the necessary arrangements for the masquerade dance to be held at Mercantile Hall, Hallowe'en night, October 29th, were completed. A luncheon was prepared and served by Mrs. C. M. Hart and Miss L. S. Jackson. Harry Simons, chairman, states the demand for tickets exceeds his expectations. These affairs are given for the purpose of fraternalizing and bolstering the Relief Fund.

A special meeting of the Executive Committee of this society was held August 18th to take action on the death of Lewis A. Riley, a Western Union telegraph operator, who died August 17th of tuberculosis, which he contracted about five years ago. An order for $100 was authorized, and a check for this amount sent to his widow. During the illness of Mr. Riley the Relief Fund proved its usefulness.

Robert C. Murray, secretary of the Dot and Dash Club, reports having received from Chairman Robert Atkinson, of the membership committee, an appreciable increase in applications for membership.

A. J. Whittingham, aged sixty years, an old-time Philadelphia, Pa., telegrapher employed by both the Western Union Telegraph Company and the Postal Telegraph-Cable Company at different times, but for the past eleven years one of the city assessors, died of heart failure on August 17th. Mr. Whittingham held many important political positions during his lifetime. He was a Thirty-second degree Mason and a prominent member of Lulu Temple.

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EDITORIAL COMMENT

The Radio Corporation of America Buys International Radio Telegraph Assets

The Radio Corporation of America has purchased the assets of the International Radio Telegraph Company. Details of the transaction were announced on September 3rd by the Westinghouse Electric and Manufacturing Company in a statement reading in part as follows:

"The Radio Corporation of America has acquired from the International Radio Telegraph Company a group of patents relating to wireless telegraphy which the Radio Corporation found it necessary to make use of to enable it to give the public proper and efficient service.

"The International Company had not embarked upon commercial work to any great extent and was confronted with important patents owned by the Radio Corporation, so that neither company was able to give to the public satisfactory service without infringing upon the patents of the other. Under the circumstances it was found essential that the right to use the several groups of patents should be acquired by one corporation."

The purchase was made, it is understood, with 1,000,000 shares of $5 par value preferred and 1,000,000 shares of no par value common stock of the Radio Corporation.

—o—

Young Men

Burdened by the daily routine of our immediate affairs, few of us find time to develop inclinations for the consideration of such problems as that of the relation of our young men to the future. The trouble is that most of us have fixed a personal goal towards which we continually strive, and in our strivings are impatient with everything that does not bear directly upon the attainment of that goal. We get absorbed in the game. Call it anything you like, interest or ambition; give it all the values it possesses, and still it will fall short of being justifiable if in the long run our absorption tends to retard the fruition of present tendencies towards increased material comforts and spiritual welfare. Besides, we can always play a better game when we make it have a meaning beyond the mere excitement of the contest. In either case, the ultimate goal lies far beyond the end of the time of any of us now active in the affairs of the world, and it therefore becomes necessary for us to consider the young men about us—the heirs of tomorrow, the men who will be at the head of affairs two decades from now. What does the present generation owe the next generation? Surely it owes more than it pays. Like every managing generation since the dawn of reason we are in the main unreasoning where youth is concerned. We are much more proficient in criticism than in guidance. Our fault-finding and impatience with mere exuberance is general—the least qualified critics among us assume that young men ought not to be young, that they ought to be sedate and follow the examples of their elders. Worst still, those of us who remember that we were young once apparently have no incentive strong enough to induce us to bear with inexperience, or more especially with new ideas when presented by young men.

Most of us have the attitude towards young men that holds them responsible for their failure to burst upon the world fully equipped with the knowledge which we ourselves have accumulated only after years of trial and error. Perhaps it is best that young men find out things for themselves, that they acquire the habit of self-reliance, but they are at least entitled to know what it is all about, or at least to know what we think it is all about. Certainly, if they are denied guidance in this particular, we need not be surprised if they take the wrong turn at some distant crossroad when theirs is the hand at the wheel. Then, too, we seldom remember that we are not handing them a world in which everything is in perfect order.

—o—

American Radio Relay League at Chicago

The first national American Radio Relay League convention met in Chicago on August 30th to September 3rd, at the Broadway Arena. Some of the foremost radio technical and scientific men were present, and many of them addressed the convention. Several of the speakers were prominent Government officials interested in radio.

Many important papers on the subject of radio were read and discussed. They included the subject of interference control, time revision regulations, traffic regulations, observation of laws, legislative matters, etc. Several technical sessions were held. The following were among the speakers who addressed the convention: F. F. Hamilton, on "Antenna Design for Amateurs"; Major-General Squier, on "Tree Radio"; Admiral Bullard, on "Late Developments in Navy Radio Equipment"; S. Kruse, on "Practical Points on Spark Transmitter Construction"; M. B. West, on "Spark Transmitters and Power-Factor"; J. K. Hewitt, on "Station 2 RK"; Paul Godley, on "Spark Receiving Apparatus," and E. W. Stone, on "Vacuum Tube Construction."

—o—

J. B. NORRIS, for many years manager of the Western Union Telegraph Company at Chattanooga, Tenn., for the past ten years a resident of Santa Monica, Cal., in remitting to cover his subscription for three years, writes: "The AGE is the only link to my old-time telegraph connections. May it continue to prosper."

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CUSHMAN ELECTRIC COMPANY, Inc.

Manufacturers of

MOTOR GENERATORS

For

TELEGRAPH, TELEPHONE AND SIGNAL SERVICE

GENERATORS, MOTORS AND DRIVES FOR SPECIAL APPLICATIONS

Our Production and Distribution will be under the expert supervision of Mr. Alexander P. Achimore (Formerly Power Engineer Western Union Telegraph Co.)

General Offices and Factory,
CONCORD, N. H.

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Garwood, N. J. Chicago

MANUFACTURERS OF THE

GILL SELECTOR

THE UNIVERSAL SELECTOR
FOR
TELEGRAPH AND TELEPHONE

The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.
1205 Hobart Bldg., San Francisco, Cal.
2044 Railway Exchange Bldg., St. Louis, Missouri.

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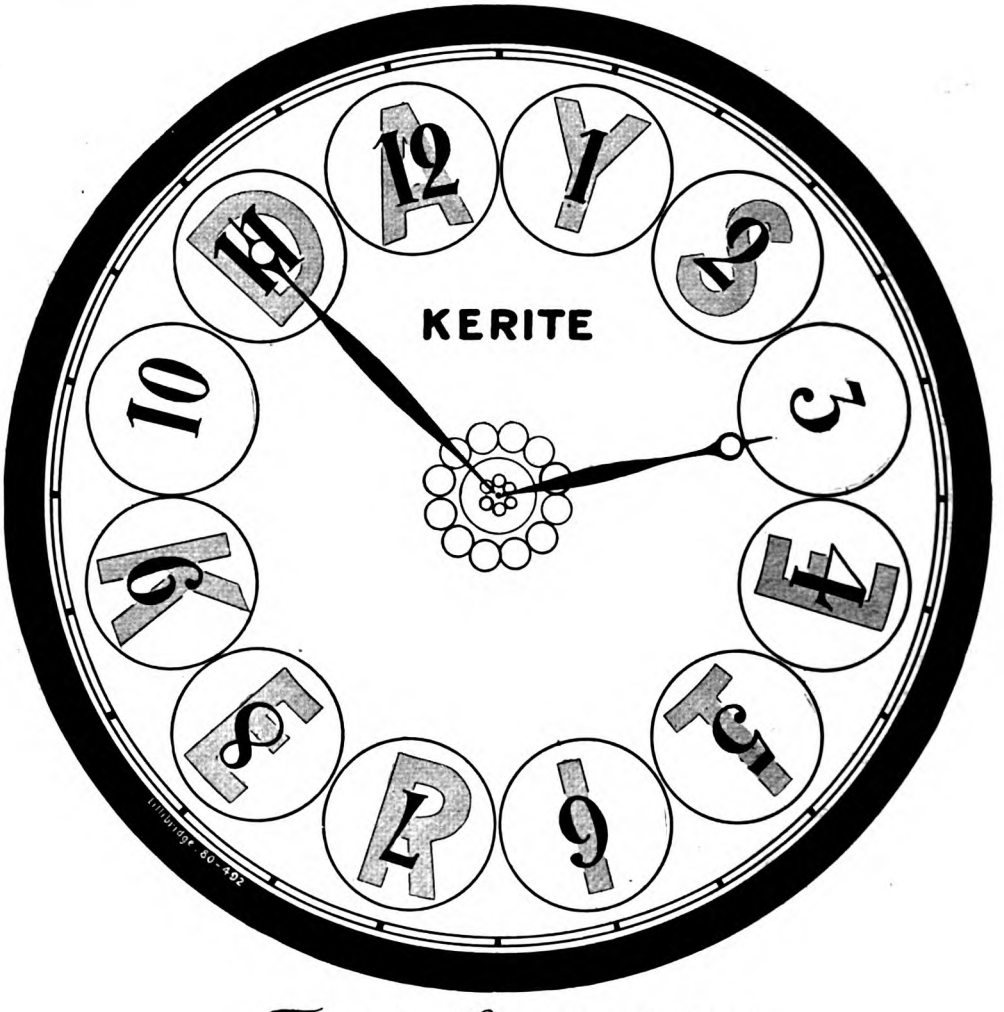

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The most efficient and
permanent insulation
known is

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KERITE INSULATED WIRE & CABLE COMPANY
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THE RAILROAD

Program, Fourth Session (Annual Meeting), Telegraph and Telephone Section, American Railway Association

The program of the Fourth Session (annual meeting) and the officers and committees of the Telegraph and Telephone Section, American Railway Association, to be held at the Hotel Cleveland, Cleveland, Ohio, September 21st, 22nd and 23rd, 1921, are as follows:

OFFICERS

H. Hulatt, Chairman, Montreal, Que.
W. H. Hall, First Vice-Chairman, Denison, Tex.
R. F. Finley, Second Vice-Chairman, Cleveland, Ohio.
W. A. Fairbanks, Secretary, New York, N. Y.

COMMITTEE OF DIRECTION

H. Hulatt, Montreal, Que.; W. H. Hall, Denison, Tex.; R. F. Finley, Cleveland, Ohio; E. C. Keenan, New York, N. Y.; J. F. Caskey, Bethlehem, Pa.; G. A. Cellar, Philadelphia, Pa.; E. A. Chenery, St. Louis, Mo.; E. E. Dildine, St. Paul, Minn.; G. D. Hood, Chicago, Ill.; J. McMillan, Montreal, Que.; C. S. Rhoads, Indianapolis, Ind.

REGISTRATION AND BADGES

All representatives of members and affiliated members will please register at the Registration Desk of the Section. After registration and at the noon adjournment on the first day, identification badges will be issued to those registering. All are particularly desired to wear the badges during the entire session.

BUSINESS SESSIONS

WEDNESDAY, SEPTEMBER 21

9.30 a. m. Call meeting to order.
9.35 a. m. Address of Welcome by Mayor of Cleveland.
9.45 a. m. Remarks by R. H. Aishton, President, American Railway Association.
9.55 a. m. Remarks by General W. W. Atterbury, Vice-President in Charge of Operation, Pennsylvania System.
10.05 a. m. Remarks by W. J. Fripp, General Manager, Lines East, New York Central Railroad.
10.15 a. m. Registration of Representatives of Members and Affiliated Members.
10.20 a. m. Minutes of Session, September 22, 23, and 24, 1920.
10.25 a. m. Announcements and Appointment of Committee on Resolutions.
10.30 a. m. Remarks by Chairman.
10.50 a. m. Address by Dr. Dayton C. Miller, Professor of Physics, Case School of Applied Science.
11.35 a. m. Report of Committee on Direction.
11.55 a. m. Report of Committee No. 1—Construction and Maintenance—Outside Plant.
12.05 p. m. Report of Sub-Committee "A"—Construction and Maintenance of Pole Lines.
12.30 p. m. Adjourn for Luncheon.
2 p. m. Address by Joe Marshall, Special Representative of the Freight Claim Division, American Railway Association, relative to "Freight Claim Prevention."
2.10 p. m. Continuation of Report of Sub-Committee "A"—Construction and Maintenance of Pole Lines.
2.35 p. m. Report of Sub-Committee "B"—Wire Crossings.
3.30 p. m. Adjourn to View Exhibits.

THURSDAY, SEPTEMBER 22

9.30 a. m. Paper presented by O. B. Blackwell and E. H. Colpitts, entitled "Carrier Current Telephony and Telegraphy."
10.05 a. m. Report of Sub-Committee "D"—Transpositions.
10.20 a. m. Report of Committee No. 2—Con-

HAVE YOU EVER THOUGHT

how nice it would be to have a slip base relay so that when your Chicago duplex is tied up because the relay contacts are worn down you can swap it out in one minute.

We've thought of it a lot and here's the relay.

The price is reasonable and we'll send you one for examination if you wish.

MORKRUM COMPANY

1410 Wrightwood Avenue

CHICAGO

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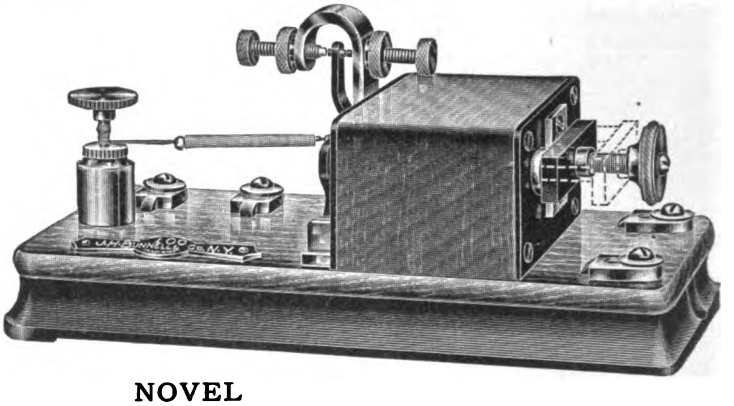
THE GHEGAN RELAY



NOVEL

A radical departure in method of **Adjusting the Magnetic Circuit** is a novel feature of the GHEGAN RELAY, in which the result is obtained by moving the yoke or back iron from contact with the cores.

SENSITIVENESS

The armature and cores are maintained in close proximity so that all lines of force pass through the armature, making it **much more sensitive** than the old method of separating the cores and armature, which permitted some lines to pass direct from one core to the other without passing through or affecting the armature.

PROTECTION

This fixed position of the magnets permits absolute protection to the wires from magnet spools to terminals as well as to the spools themselves.

SIMPLICITY

The Ghegan Relay is simplified in construction by eliminating sliding mechanism for adjusting the magnets and dispensing with the magnet adjustment post and spring.

The illustration shows all these points. The magnet spools and their connecting wires are protected by a substantial cover, the yoke is shown in closed position, in contact with the cores, the dotted lines indicate its position when fully separated from them.

The adjustment operation has not been changed.

Turning the nut to the right, or clockwise, withdraws the yoke from the cores and produces the same effect as withdrawing the cores from the armature. An ingenious arrangement prevents any sudden change at moment of separation.

In short, it is a **handsome, compact** and **practical instrument** of the very **highest grade, simple, sensitive** and **durable.**

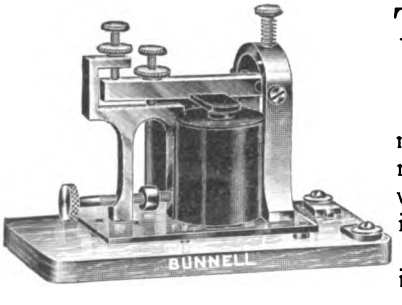
It can be furnished in the different forms of multiple windings and mountings for multiplex and repeaters, etc.

It is an improvement that will keep them "on the job" and "away from the repair shop" indefinitely.

ATTRACTIVE PRICES

The prices of the various types and windings will be found attractive and will be quoted on application.

List price of Single Relay, mounted on slate base, with iron surbase and fireproof magnet covers, wound to 150 Ohms, $9.00. Subject to usual discount.



The New Ghegan Main Line Sounder

SIMPLEX FORM

This Sounder, like the Ghegan Relay, keeps the magnet and armature in fixed positions, and varies the magnetic circuit by moving the yoke or back iron with a knurled-headed adjusting screw, which is shown in the illustration, in front of the sounding post.

The new Ghegan Main Line Sounder is simple in construction, perfect in work, and low in price.

Prices, Discount Schedule BA:

New Ghegan Main Line Sounder only, 50 Ohms	**$9.00**
New Ghegan Main Line Sounder only, 150 Ohms	**10.00**
With Key on Base, 50 Ohms	**12.00**
With Key on Base, 150 Ohms	**13.00**

J. H. BUNNELL & CO., (Incorporated) **32 Park Place, New York**

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struction and Maintenance—Inside Plant.

10.30 a. m. Report of Sub-Committee "G"—Apparatus and Materials.

11 a. m. Report of Sub-Committee "H"—Locations and Layouts.

11.15 a. m. Report of Sub-Committee "J"—Circuits and Current Supply.

12 m. Report of Sub-Committee "K"—Installation and Maintenance.

12.30 p. m. Adjourn for Luncheon.

2 p. m. Continuation of Report of Sub-Committee "K"—Installation and Maintenance.

2.15 p. m. Paper presented by Stanley Rhoads, Telegraph and Telephone Engineer, New York Central Lines, entitled "Some Phases of Railroad Telegraph and Telephone Engineering."

3 p. m. Report of Committee No. 3—Protection Against Electrolysis.

3.30 p. m. Report of Committee No. 4—Protection Against Lightning or Electric Light and Power Circuits.

4.30 p. m. Report of Committee No. 5—Telegraph and Telephone Development.

5 p. m. Report of Committee No. 6—Message Traffic.

5.30 p. m. Adjourn for day.

FRIDAY, SEPTEMBER 23

9.30 a. m. Continuation of Report of Committee No. 6—Message Traffic.

10 a. m. Report of Committee No. 7—Inductive Interference.

10.30 a. m. Report of Committee No. 9—Future Activities and Topics.

10.45 a. m. Report of Committee No. 10—Technical Training.

11.30 a. m. Report of Committee No. 11—Telephone Transmission.

12 m. Report of Committee No. 12—Radio and Wired Wireless.

12.30 p. m. Adjourn for Luncheon.

2 p. m. Continuation of Report of Committee No. 12—Radio and Wired Wireless.

2.30 p. m. Report of Committee on Nominations.

2.35 p. m. Nominees for Committee on Nominations.

2.40 p. m. Appointment of Tellers.

2.45 p. m. Election of Officers, Members of the Committee of Direction and Members of the Committee on Nominations.

3 p. m. Report of Committee on Resolutions.

3.15 p. m. Miscellaneous or New Business.

3.30 p. m. Report of Tellers as to Election of Officers, Members of Committee of Direction and Members of Committee on Nominations.

3.40 p. m. Introduction of Officers.

4.30 p. m. Adjourn Meeting.

NOTE.—Representatives of members and affiliated members are urged to bring before the session any subjects in which they are interested and which have not been covered by the foregoing program.

SATURDAY, SEPTEMBER 24

The new Committee of Direction, to be elected at the Cleveland session, will hold a meeting.

The Committee of Arrangements covering the Cleveland session consisted of R. F. Finley, Chairman, Cleveland, O.; J. A. Jones, Charlotte, N. C.; B. A. Kaiser, New York, N. Y.; E. C. Keenan, New York, N. Y.; W. T. Kyle, New York, N. Y.

Local Committee—A. Behner, W. L. Blair, A. Collins, D. H. Morris, J. M. Spangler.

Ladies' Reception Committee—Mrs. A. Behner, Mrs. W. L. Blair, Mrs. G. A. Cellar, Mrs. A. Collins, Mrs. R. F. Finley, Mrs. W. H. Hall, Mrs. H. Hulatt, Mrs. W. T. Kyle.

Statistics of Annual Meetings of the Association of Railway Telegraph Superintendents and its successor, the Telegraph and Telephone Section of the American Railway Association, follow:

November 20, 1882, Chicago, Ill., W. K. Morley, President.

June 13, 1883, Chicago, Ill., W. K. Morley, President.

September 17, 1884, Philadelphia, Pa., W. K. Morley, President.

June 17, 1885, Cleveland, Ohio, C. Selden, President.

June 16, 1886, St. Paul, Minn., C. W. Hammond, President.

July 13, 1887, Boston, Mass., A. R. Swift, President.

July 11, 1888, New York, N. Y., G. L. Lang, President.

October 16, 1889, Washington, D. C., G. C. Kinsman, President.

June 18, 1890, Niagara Falls, N. Y., C. A. Darlton, President.

June 15, 1892, Denver, Col., C. S. Jones, President.

June 20, 1893, Milwaukee, Wis., L. H. Korty, President.

June 13, 1894, Detroit, Mich., U. J. Fry, President.

June 12, 1895, Montreal, Can., O. C. Greene, President.

June 17, 1891, Cincinnati, Ohio, G. T. Williams, President.

June 17, 1896, Old Point Comfort, Va., M. B. Leonard, President.

June 16, 1897, Niagara Falls, N. Y., G. M. Dugan, President.

June 15, 1898, Omaha, Neb., J. W. Lattig, President.

May 17, 1899, Wilmington, N. C., W. W. Ryder, President.

June 20, 1900, Detroit, Mich., L. B. Foley, President.

June 19, 1901, Buffalo, N. Y., W. F. Williams, President.

June 18, 1902, Chicago, Ill., C. F. Annett, President.

May 13, 1903, New Orleans, La., J. H. Jacoby, President.

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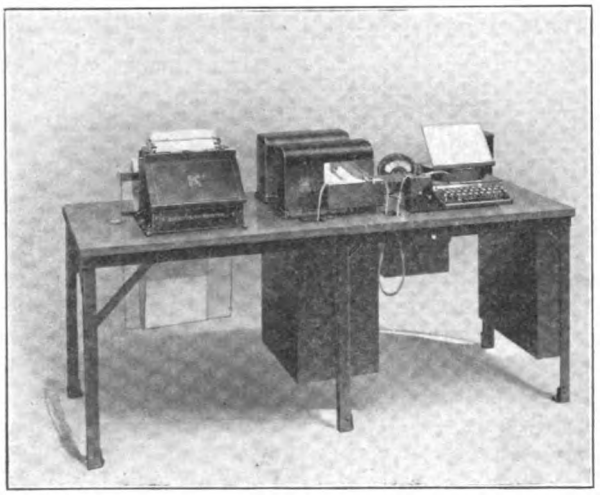

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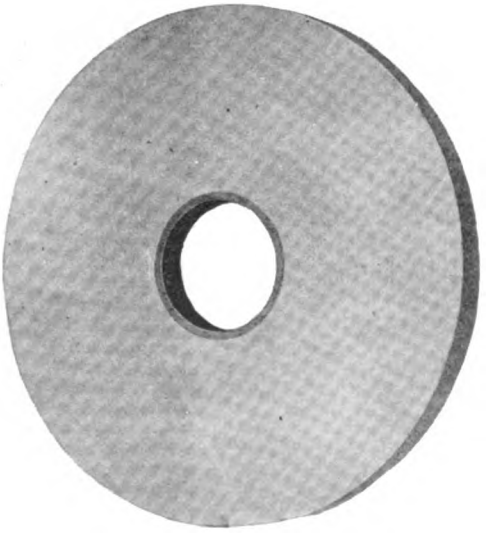

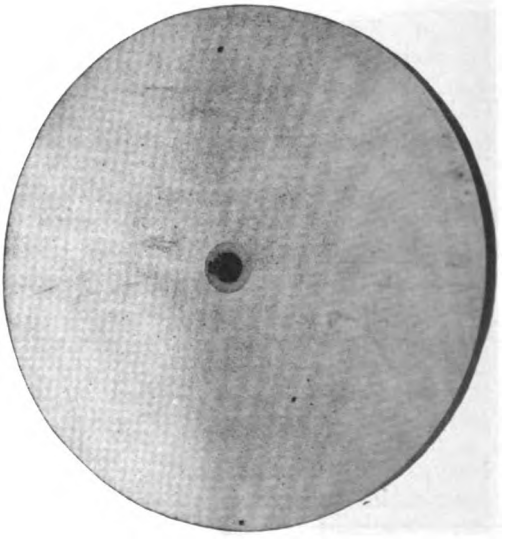

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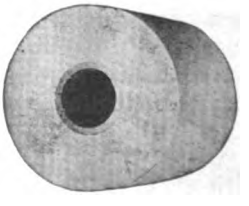

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June 15, 1904, Indianapolis, Ind., C. S. Rhoads, President.

May 17, 1905, Chattanooga, Tenn., H. C. Hope, President.

June 20, 1906, Denver, Col., E. E. Torrey, President.

June 19, 1907, Atlantic City, N. J., E. A. Chenery, President.

June 24, 1908, Montreal, Can., E. P. Griffith, President.

June 23, 1909, Detroit, Mich., W. J. Camp, President.

June 20, 1910, Los Angeles, Cal., J. L. Davis, President.

June 26, 1911, Boston, Mass., I. T. Dyer, President.

June 4, 1912, New York, N. Y., G. A. Cellar, President.

May 20, 1913, St. Louis, Mo., J. B. Sheldon, President.

May 19, 1914, New Orleans, La., Wm. Bennett, President.

June 22, 1915, Rochester, N. Y., W. C. Walstrum, President.

June 20, 1916, St. Paul, Minn., E. C. Keenan, President.

Special Meeting, November 22, 1917, Chicago, Ill., M. H. Clapp, President.

December 5, 1918, Chicago, Ill., M. H. Clapp, President.

June 10, 1919, Chicago, Ill., M. H. Clapp, President.

The name of the Association was changed to the Telegraph and Telephone Section of the American Railway Association in February, 1919, and Martin H. Clapp, manager of the Telegraph and Telephone Section of the United States Railroad Administration, became chairman of the Telegraph and Telephone Section until October, 1919, when he resigned to go with the Western Union Telegraph Company. J. F. Caskey, superintendent of telegraph, Lehigh Valley Railroad, South Bethlehem, Pa., was elected chairman, and he served until September, 1920, when H. Hulatt, manager of telegraphs, Grand Trunk Railway System, Montreal, was elected chairman, who will serve until the election of his successor at the Cleveland session.

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IN connection with the annual meeting to be held at the Hotel Cleveland, Cleveland, Ohio, September 21st, 22nd and 23rd, Committee No. 13—Arrangements, desires to announce that it is anxious to have every member present attend the "Get-together" meeting. Through the courtesy of the Railway Telegraph and Telephone Appliance Association, the usual informal "Get-together" reception will be held at the Hotel Cleveland, Tuesday, September 20, at 8 p. m., on which occasion the program for the convention and the social arrangements will be announced.

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A JOINT meeting of Committee No. 4—Inductive Interference of the Telegraph and Telephone Section of the American Railway Association, was held in New York on September 7th, in conjunction with a sub-committee on Inductive Interference of the American Railroad Engineering Association, Committee of Electricity. The Telegraph and Telephone Section was represented by L. Behner, chairman, Pittsburgh; I. C. Forshae, Philadelphia; W. A. Jackson, Detroit; G. W. Jett, Roanoke, Va.; L. P. Ferris, E. F. Trueblood and Stanley Rhoads, New York. The membership discussed various items pertaining to Inductive Interference, with a view to presenting a report in detail at the fall meeting of the American Railroad Engineering Association.

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E. E. TRAFTON, telephone engineer of the Brooklyn Rapid Transit Company, Brooklyn, N. Y., has resigned and the vacancy has ben filled by the appointment of R. C. Johnson, with the title of signal engineer.

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The New Salt Lake Western Union Office

By FRANK D. GILES, of Los Angeles

In the issue of August 16th, I notice the AGE, in its report of the cut-over of the new Salt Lake office, implies that I am a venerable gentleman somewhere up in the eighties, as it credits me with the management of that office in 1862, three years before I became acquainted with the Morse alphabet, and nineten years before I assumed charge there, and then not by any means as its first manager.

I hope I impressed the writer of the article with the idea that I was vigorous for my age, but I do not desire any credit that I am not entitled to.

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Obituary

LESTER B. BRAGG, aged sixty-four years, an old-time telegrapher, and for many years with the New England Telephone and Telegraph Company, died near Portland, Maine, on August 29th. Mr. Bragg had worked for the American Rapid, the Baltimore and Ohio, and the Western Union Telegraph companies, as well as the telephone company.

JOSEPH G. SUPPLE, a radio operator on the United States submarine O-9, was drowned on August 31st, during the manoeuvers of the fleet of submarines and destroyers off Provincetown, Mass., when a giant wave washed him from the bridge just after the vessel had emerged from a practice dive.

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Cable Map of the World

The International Bureau of Communications, located at Berne, Switzerland, has issued a map showing the cables of the world. The map measures 21 inches long by 25 inches wide. There are fifty-five submarine cables shown on the map. Copies can be obtained at 50 cents each from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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PERSONAL

N. T. COLLETTE, an old-time telegrapher, formerly and for many years of Seattle, Wash., but well known in all sections of the country, is now in Tampa, Fla., where he is identified with the fruit business.

H. W. TARKINGTON, of the Missouri Pacific System, Jefferson City, Mo., was in New York recently while on an extended vacation, visiting Eastern points.

J. G. CASE, the founder of the Bankers and Merchants Telegraph Company in 1880, and a well-known telegraph official forty years ago, now residing on his farm at Kirkville, N. Y., in renewing his subscription for another year, writes: "My love goes out to the old boys of the fraternity, and I send a hearty '73' to each one of them."

GEORGE A. MUDGETT, now of Roylton, Vermont, was a recent New York City visitor. Mr. Mudgett made it the occasion to call on many of his friends. He was a prominent figure in telegraph circles in the seventies and eighties in New York, being a member of the 195 Broadway Western Union Telegraph Company's force. He was also an electrical engineer of note of those days, having devised many electrical devices. For many years past, Mr. Mudgett has devoted his energies to the electric light industry.

POSTAL TELEGRAPH-CABLE COMPANY

CLARENCE H. MACKAY, president, has been decorated by King Albert, of Belgium, with the Cross of Knight Commander of the Order of the Crown of Belgium. Mr. Mackay was also recently decorated with the Cross of the Legion of Honor by the French Government.

C. H. MACKAY, president of the company, has returned with his family to his home at Roslyn, L. I., after spending the month of August at Southampton, L. I.

F. J. KERNAN, auditor, after being away for several months, due to severe illness, returned to his desk September 6th.

J. J. WHALEN, traffic manager, is again at his office after a short rest.

M. F. GEIGLE, of E. P. Tully's office, is inspecting offices and branches at Pittsburgh, Cleveland, Erie and Buffalo.

THE inter-city contest among Postal Telegraph managers for the months of July and August resulted in much good-natured rivalry. The figures have not yet been completed, so that it is not known at this time who are the banner winners, or who will receive the invitations to the Fall Dinner of the Magnetic Club of New York. The managers are now entering on a second contest, and some of the "near winners" are determined to make good during the next period.

New York Operating Department

MRS. E. M. Hayden, of this office, is very sick and has been in the Bridgeport hospital for the past few weeks.

HIS honor, the "Stork," has presented to Mr. and Mrs. Walter Redlefson a bouncing girl. Mrs. Redlefson was formerly Miss May Feehan of this office.

Managers Appointed

J. Maxwell, Lamar, Colo.; G. F. Townsend, Orangeburg, S. C.; T. B. Walden, Arcadia, Fla.; Mrs. J. M. Booth, Bartow, Fla.; B. H. Harpe, Fernandina, Fla.; A. J. Weir, Ft. Valley, Ga.; Earl Hofer, Albion, N. Y.; J. S. Lee, Denison, Texas; J. J. Crowley, Owosso, Mich.; E. C. Nordstrom, Champaign, Ill., and V. L. Arnold, Hannibal, Mo.

HARRY ZEIGLER of the Augusta, Ga., force was a recent New York visitor. Mr. Zeigler in the late seventies was a member of the New York City fraternity, and was in those days one of the crack operators of the city. He is on an extended vacation, and will visit the Eastern States before his return to Augusta.

Magnetic Club

J. J. WHALEN, president of the Magnetic Club, New York, announces that the dinner of the club will be given some time in October, the exact date not having yet been decided upon. A large delegation of members living outside of New York is expected to be present.

Commercial Cable Co.

ALFRED C. GUILLOT, aged fifty-four years, for the past twenty-six years private secretary to Clarence H. Mackay, president of the company, died suddenly on September 10th. Mr. Guillot was also private secretary to the late John W. Mackay. Mr. Guillot was unmarried, and is survived by his sister and two nieces.

Telephone Pioneers of America

The tenth anniversary celebration and annual meeting of the Telephone Pioneers of America will be held at St. Louis, Mo., on Monday, October 24th, and Tuesday, October 25th, with headquarters at the Hotel Statler.

The business meeting will be held in the morning of Monday, the 24th, at which H. B. Thayer, president, will preside.

The program of entertainment is an extensive one and will fill up the entire time of the stay of two days in St. Louis.

A special train carrying the delegates from New York will leave this city on Friday, October 21st, and will make several stops en route for entertainment by telephone people.

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WESTERN UNION TELEGRAPH CO.

G. M. YORKE, vice-president of the company, has been absent from his office on vacation since September 1st.

C. H. TRANSFIELD, superintendent of the cable stations in Newfoundland, was in New York last week for a few days, enroute to England, where he will spend his vacation.

F. E. D'HUMY, central office engineer, has returned to his office after a brief rest in the country.

H. C. CHACE, superintendent of telegraph of the Santa Fe System, Topeka, Kansas, was a recent executive office visitor.

New York Operating Department

JOSEPH GSCHWIND, assistant chief operator, has been promoted to the night chief operatorship, vice J. F. McGuire, deceased.

D. J. CONDON, of the newspaper desk, has been appointed acting assisting chief operator, vice Joseph Gschwind, appointed night chief operator.

W. E. SEAMAN, aged sixty-five years, cable receiver in the main office at 195 Broadway, New York, died on September 5th. Mr. Seaman had occupied the position as receiver of cablegrams for over forty years.

FRANK A. STUMM, an old-time telegrapher, during the Civil War a member of the United States Military Telegraph Corps, now living in retirement at Arcola, N. J., has the sympathy of his friends in the death of his wife, which occurred on September 1st.

J. W. ATKINS, manager at Key West, Fla., has returned to his office after an absence due to sickness.

J. MARSHALL, chief operator of the San Antonio, Tex., office of this company, who was operated on sometime ago, is rapidly convalescing, and it is expected that he will return to duty on October 1st.

Managers Appointed

ASHTABULA, Ohio, N. A. Johnson, vice V. M. Edwards, furloughed; New Philadelphia,, D. M. McKeehen, vice N. A. Johnson, transferred; Niles, Ohio, A. J. McGary, vice Claire Fellows, resigned; Bellefontaine, Ohio, B. P. Lindsay, vice W. J. Dugan, furloughed, and Sardinia, Ohio, Harry Stein, vice Miss Iona Arzeno, furloughed.

E. A. BLOOD, formerly manager at Tarrytown, N. Y., has returned to the service at White Plains, N. Y.

O. H. PEACOCK, formerly of Superintendent Sale's office, Richmond, Va., assisted with the heavy file at Saratoga, N. Y., during the month of August.

F. T. BARKER, manager at Springville, N. Y., has returned after a leave of absence.

MISS E. G. Woolsey, formerly manager at Monticello, N. Y., has been transferred to New Rochelle as bookkeeper and cashier.

MISS Marion Mooney of Albany, N. Y., has been appointed acting cashier during the vacation of Cashier Miss Helen Murphy.

O. A. K. WANDKE, for several years manager of the office in the Borland Building, recently returned to duty after undergoing a serious operation. He has been assigned to the Money Transfer Department at 123 W. Jackson Boulevard.

MANAGER Goodreau, of one of the Chicago branch offices, reports the arrival of Junior Goodreau.

Boston

A. S. MEYER and R. W. Dodd, wire chiefs on the early night force, hold the Western Union tennis championship at doubles, defeating H. L. Tufts and D. J. Stein, of the service department, in straight sets, 6—4, 6—4, 7—5, 6—3. Other tennis sharks dispute the claim, so a Western Union tournament has been arranged and will be played in the near future.

O. S. CHAMBERS, assistant chief operator, is spending his vacation in Vermont. His machine is running well, so he won't worry about the high railroad rates. On his way back he will try and find a satisfactory park for the Association Western Union Employees' picnic.

A. E. WILKES, of the testing and repeating force, has just returned from his vacation. Mr. Wilkes came to Boston with the crew that installed the new main office in 1916 and liked Boston so well that he settled in the Hub.

W. S. HAMILTON, of the Mux plant force, is on vacation.

E. J. O'CONNOR has returned from the Association Western Union Employees' Eastern Division conference, held in Baltimore. He was delegate from Traffic Local No. 57. Park Harrington, of Boston, was re-elected vice-president, and Frank Dresser, also of Boston, was elected division delegate.

THIS company is negotiating for a lot fronting on Locust Street and running through to Eleventh Street, Philadelphia, the size of which will be 126 by 145 feet. It is proposed to erect a four-story structure to take care of the main operating room and house the different district officials of the several departments. The building will be connected with all of the neighboring branch offices by pneumatic tubes and it will be strictly up-to-date in every respect and in keeping with buildings that have recently been erected for similar purposes in other large cities.

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All America Cables

PRESIDENT J. L. Merrill and his family returned on September 6th, after a pleasant sojourn at Kennebunkport, Maine.

W. A. BEHAGEN has been appointed in charge at La Libertad, temporarily, vice E. O. German, on sick leave.

J. DINNIGAN, supervisor at Santiago, Chile, has been retired on pension.

J. T. SMITH is temporarily in charge at Guayaquil, Ecuador, during the absence of Manager Powell.

W. HANNAH, manager of the Broad Street, New York, office, has completely recovered from his recent illness.

F. A. PIRIE, general commercial superintendent, has just returned from Rockport, Mass., where he spent his vacation.

A. DAVIDSON, vice-president, together with his family, is at Rockport, Mass., on vacation.

THIS company has announced the establishment of a new cable to Porto Rico. The rate per word from New York for ordinary messages is forty cents, and deferred rate messages twenty cents.

Radio Corporation of America

PRESIDENT E. J. Nally is now in paris.

THE initial dinner of the newly-formed Static Club, a social organization, for the promotion of good fellowship among radio officials and employees, occurred at the Hotel Astor, New York, September 8th, the number present being fifty-two. Dr. A. N. Goldsmith, president, presided and stated that the membership is now one hundred and seven. W. A. Winterbottom, traffic manager, who has just returned from an extended trip in Europe, gave a highly interesting talk on radio and general conditions on the other side. The affair was a most successful one.

THE new transmitting station at New York Radio Central will be placed in service September 19th.

WILLIAM BROWN, attorney, has returned from his vacation spent in Maine.

The International stations at Cape May, N. J., and New London, Conn., are being continued by the Radio Corporation of America. The Radio Corporation has closed its coastal marine station at Belmar, N. J., and transferred the code letters W M Y to the Bush Terminal, Brooklyn, N. Y., which was formerly an International station. The old International station at Siasconset, Mass., has been closed temporarily and the business is being transacted by the Radio Corporation station at Chatham, Mass.

G. E. COLE, traffic superintendent of the International Radio Telegraph Company, has joined the traffic staff of the Radio Corporation of America.

French Cable Staff Honors Retiring Officials

The retirement on pension of Superintendent George Stewart Hall and Chief Supervisor Agnew F. Toovey from active service in the French Cable Company's terminal station in Orleans, Mass., was made the occasion of a notable testimonial of regard by the company's staff on August 28th.

To aid further in making the affair a success, Mr. Gegou, the American representative of the company at headquarters, New York, graciously authorized a short recess so that the operator on duty should partake in the festivities, as the Southward Inn is practically next door to the cable office.

Mr. Hall and Mr. Toovey were pioneer operators when the cable company established its first station in North Eastham, over two score years ago. They came, young fellows at the time, from Scotland and England, respectively. During the many changes of personnel, and the revolutionary developments in the working equipment of submarine cables in that long period, both remained continuously in the service on Cape Cod, passing through all grades of rank until they now retire with the highest honors in the gift of their employers.

Edgar H. Upham, the new superintendent, presided, and paid a high tribute to the worth of the guests of the evening, with whom he had been so long associated in the company's service. Mr. Upham read messages of congratulation and farewell to Mr. Hall and Mr. Toovey from the superintendents and staffs of the company's stations in Brest, France, St. Pierre, Miquelon, and New York City, also from the heads of other cable companies.

The other speakers were Messrs. James Dickie, Lewis H. Delano, L. J. Williams, Ralph Deschamps, L. J. Bouroult and Michael Fitzgerald.

Mr. Upham then presented the handsome jeweled gifts. Mr. Hall in thanking the staff for their kind and generous attitude, referred to the many changes that had taken place since he first joined the telegraph service, fifty years ago. It would be hard to part with the boys with whom he had been so closely associated, but it was intensely gratifying to him to know that the feeling was mutual. He would still be their neighbor and would keep an eye on their progress in the service.

Mr. Toovey, who was also heartily greeted, expressed his gratitude for the good-will of the boys. He would miss his daily routine in the office, but he hoped to keep in touch with his old friends. Their kindness to him would be always his most pleasant memory.

The evening concluded with a parting cheer for the guests.

Those present were: Messrs. Edgar H. Upham, James Dickie, L. H. Delano, Ralph Deschamps, L. J. Bouroult, James Wilson, L. J. Williams, Leon Deschamps, Raymond Nickerson, Elliott Dickie, Dawson Fulcher, Eugene Lemeur, Eugene Davis, Louis Lemeur, Joseph Davis, George Wittman, Pierre Lapaix, Gaston Norgeot and Michael Fitzgerald.

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Pacific Cable Board

The following staff transfers have recently taken place: Melbourne to Sydney, B. G. Thomas; Auckland to Fanning Island, D. C. P. Holmes; Bamfield to Southport, R. H. S. Baxendale; Suva to Auckland, H. Christian; Cable ship *Iris* to England, G. B. Wintsfield and J. D. S. Fleming; Auckland to cable ship *Iris,* S. W. Fitzpatrick; Bamfield to Auckland, J. Paesch; Halifax to Bamfield, W. R. Rutherford; Sydney to Suva, A. E. T. Langford; Vancouver to England, E. C. Mansifield.

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The Root of Efficiency

By An Official

It is one thing to idealize methods of conducting business and quite another to put them into everyday use. No doubt some good is accomplished in pointing out the best way to do things, but since ideal methods seldom find ideal conditions for their application, and since, furthermore, most telegraph men of experience are more or less equipped with the same ideals, there is very little that any of us can impart not already in possession of the rest of us. Assuming, therefore, that we all possess the same efficiency ideals, how to get them working is more to the point than reiteration of the ideals themselves. Some good is derived from a recital of each other's experience in the manner we apply certain well-known methods in obtaining results. It is a cardinal principle of our business that from the time a message is handed in at the counter until it is delivered, the least possible delay should occur. Another well-known principle is—messages requiring answers should be made the special concern of the delivering office. The questions involved in these two propositions are capable of solution in different ways with equally good results. What one of us finds accomplishes the purpose another finds unworkable, and so it is with all questions relating to service. There is one thing we are all agreed upon; it is, in fact, our common concern; that is the necessity for best results or efficient service, for it is upon this qualification that our standing with our master, the public, rests, and with the retention of his favor our revenue earning power. It is conceded that we are all plentifully fortified with efficiency ideals, and that each has found the best manner of applying them in his particular sphere; there is still something upon which the highest efficiency ideals, and the best-laid plans for carrying them out, depends, and without which failure invariably follows. I will call this the root of efficiency and there can be no two ways about it. It is this thought I wish to emphasize, and at the close of our informal conference it is the most fitting time to do so. Thought is the measure of every human action. There can be no efficiency in even the simplest actions without deliberate thought. In other words, the efficiency of an action depends upon the amount of earnest and correct thought put into it. I remember hearing a young man tell his mother years ago when cultivating a taste for tea, upon being asked how he liked it, replied, "I am afraid, mother, that you did not put enough thought into it." Without thought being put into what we do, howsoever well we may know how to do it, we have errors, failures, inefficiency. Therefore, the best lesson we can take home with us to inculcate in those upon whom we depend to help carry on our work is thoughtfulness in the performance of duty. If there is any place in the business world where a thoughtless person is out of place it is in a telegraph office. It is a natural failing in us all, none are exempt except in degree. We are all inclined to the way of least resistance, even the force which we employ to carry on our business has the same failing, but as we endeavor to keep it to its task under varying conditions, so we should endeavor to keep ourselves and our co-workers ever alive to the requirements of an efficient service. To attempt to do business in an easy-going manner is to side-step the thought necessary to give value to the action. The bulk of errors made by operators are due to this failing. Life consists of just three things, thoughts, words and deeds; the two latter proceed from the former, and hence the value of what we say and what we do depends altogether upon what we think. To try to do things with the mind half asleep results in failure or inefficiency. There is no easy road leading anywhere worth going to, and the sooner this truth is realized the better it will be for efficient methods of business. To make our ideals efficient we must insist upon due thought and consideration being given every case as it comes along. If the counter clerk is keen and alert, which indicates an active mind, he will not forget that the message he has just taken over the counter must get to the operating room without delay, and if all handling the same message are imbued with the same spirit, even to the messenger, the chances are 99 to 100, the customer will obtain what he expects and pays for—prompt service. If the delivery clerk is wide awake and right on his job he will spot at once the message requiring an answer, and if the messenger fails to return with it, will lose no time in learning the reason, and will keep it in mind until he lands it. These results can only be obtained by earnest thought, which is the root of efficiency. Work thus performed gives the employee a feeling of satisfaction which cannot be procured in any other manner; it is the consciousness of an action well performed, is well worth striving for at all times and brings its own reward eventually. The man who does not think constantly in applying what he knows is a failure to start with in any place and especially in a telegraph office. Perfunctory work is dishonest work and the inevitable penalty is inefficiency. Therefore, I would say in conclusion, insist always upon those whose duty it is to serve the public, to think always of what they are doing and never tire of striving, for we may depend upon it, if we all strive to do our best, efficiency is bound to result and a measure of perfection in our service promoted, which is the goal we are all endeavoring to reach.

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A Radio Tournament

A world's championship speed contest in radio telegraphy is to be held in New York September 28th, 29th and 30th, in connection with the New York Electrical Show at the Seventy-first Regiment Armory. The contest will be open to all comers, and some of the fastest army, navy and commercial radio operators are expected to take part. A silver cup will be presented to the winner.

The contest will be held under the auspices of the National Amateur Wireless Association, and will be conducted by a committee representing the government radio departments and the commercial telegraph companies. Entries, which close September 29th, may be made through the National Amateur Wireless Association, 326 Broadway. There is no entry fee.

In addition to the professional contest there will be a test in receiving messages through static interference.

The Yap Controversy Settled

The Japanese Government, it is announced, approved the plan worked out by the Washington Administration for a settlement of the Yap mandate and Pacific cable question.

The plan for the settlement of this problem has been agreed upon informally in principle by Secretary of State Hughes and Baron Shidehara, the Japanese Ambassador.

The main terms of the agreement are understood to be:

One—That Japan recognize the right of the United States and other nations to use Yap as a cable landing station and for other cable purposes, while the American Government drops its objections to the allocation of Yap to the mandate of Japan.

Two—That the former German cables in the far Pacific be distributed so that the United States will have the line from Yap to Guam, Japan that from Yap to Shanghai, the Chinese end of which was diverted to Japan, and that the Netherlands' interests in the line from Yap to Menado, in the Dutch East Indies, be recognized.

—o—

THE National Amateur Wireless Association has issued a testimonial to Earl Kullman, as a permanent record of his invaluable co-operation in making available to the American public a description transmitted by radio telephone of the world's championship boxing contest, Jack Dempsey, United States, vs. Georges Carpentier, France, held at Jersey City, N. J., July 2nd, 1921.

—o—

CANADIAN

J. FLETCHER, formerly and for many years superintendent of the Canadian Pacific Railway Company's Telegraph, Winnipeg, Man., who retired from active service last January, is now living at Palo Alto, Cal., where a son and brother-in-law reside. Mr. Fletcher contemplates visiting South America next year, where he has another son.

J. G. DAVIES, district commercial superintendent, Canadian National Telegraphs, Toronto, Ont., writes: "I desire to thank you for renewing my subscription, and hope that you will always do so in the future."

A POWERFUL continuous wave radio telegraph station is being erected near Vancouver, B. C., to communicate with stations along the coast.

—o—

AN automatic telephone system is being installed in Brussels, Belgium, and it is expected to be put in service in April, 1922.

—o—

Where Was Jones?

Telephone mistakes may have their serious side. A man wanting to communicate with another man named Jones, looked in the directory and called up a number. Presently through the receiver came a soft, feminine "Hello," and he asked, "Who is that?"

"This is Mrs. Jones."

"Have you any idea where your husband is?"

He could not understand why she rang off so sharply, until he discovered he had called up the residence of a widow!

—o—

Vacuum Tubes a Live Subject

The subject of vacuum tubes is certainly a live one in these days. Inquiries for information on this subject come from all parts of the world. There are two books on the market devoted exclusively to vacuum tubes and it will be well for students and others to have copies of one or both of these valuable works.

Vacuum Tubes in Wireless Communication, by Elmer E. Bucher, price $2.25 per copy, is an elementary text book for students, operators, experimenters and engineers. It tells in understandable language the fundamental operating principle of the vacuum tube. It shows over one hundred different circuits for the practical use of the vacuum tubes as detector, radio or audio frequency amplifier, regenerative receiver, beat receiver and generator of radio frequency currents. More than one hundred diagrams reveal, step by step, in simple and direct form, the uses of the vacuum tube.

Thermionic Vacuum Tube, by Dr. H. J. Van Der Bijl, price $5.00 per copy.

The rapidly extending use of the vacuum tube as a receptor of radio waves; generator of radio oscillations; telephone repeater; alternating current rectifier, and for other purposes, has made the instrument one of the most widely discussed inventions of recent times.

Dr. Van Der Bijl, in his book, gives a thorough treatment of the entire subject of thermionics as related to vacuum tube phenomena.

The book has 282 pages and 232 illustrations.

Copies of these books or any others may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

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CONTENTS

Theory of Multi-Office Systems. By Harry E. Hershey of the Automatic Electric Company, Chicago 436
Student's Course in Technical Telegraphy. By Louis Casper. Lesson 36 437
Origin and Development of Radio Service in America. (Continued from page 415, September 16th Issue) 439
Frank T. Viles Becomes a Forty-Niner of the Telegraph. A Recollection of an Old Timer by One of Them 441
Magnetic Storms—Their Effects Upon Railway Signal and Telegraph Apparatus 442
The Washington-Greenwich Longitude. By Rear-Admiral W. H. G. Bullard 443
Carrier Current Telephony and Telegraphy. By E. H. Colpitts and O. B. Blackwell 444
History of the Morse Statute in Central Park 446
The Kleinschmidt Printing System. China to Issue Bonds for Radio Stations 447
Editorial—Million Voltage Sent by Wire for First Time. Theodore N. Vail's Advent Into the Telephone Field. Ownership Statement 448
The Railroad—Telegraph and Telephone Section of the American Railway Association, Hotel Cleveland, Cleveland, Ohio 451
All America Cables. The Cable. Radio Corporation of America. Sweden Radio Project. Code at a Glance 455
Personal. Postal Telegraph-Cable Company. Fall Dinner of the Magnetic Club 456
Western Union Telegraph Company 457
Western Union Telegraph Company (Continued) 459
Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps. Telephone Pioneers of America. Institute of Radio Engineers. Ohio Phone Companies Unite 460

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Theory of Multi-Office Systems

By HARRY E. HERSHEY,
Of the Automatic Electric Co., Chicago

(*Continued from page* 412, *September* 16*th issue*)

In our discussions so far we have used only first selector switches, and therefore the size of our exchange is limited to 1,000 lines. If second selectors are inserted betwen the banks of the first selectors and the connectors, the size of the exchange will be increased to a possible 10,000 lines. The following table gives the relationship between switchboard equipment and the ultimate size of the system:

Switchboard Equipment	Ultimate Size of System
Connectors	100 lines
First Selectors and Connectors.....	1,000 lines
First Selectors, Second Selectors and Connectors	10,000 lines
First Selectors, Second Selectors, Third Selectors and Connectors..	100,000 lines
First Selectors, Second Selectors, Third Selectors, Fourth Selectors and Connectors	1,000,000 lines

In construction and circuit arrangement these various selectors are all similar to the selector shown in Fig. 24 printed in the August 16th issue. The term first, second, third and fourth relates only to the position of the selector in the system.

It will be recalled that there are three conductors in the trunk between a selector and a connector, and of course there must be a three conductor trunk between selector and selector. If a complete system is housed in one office the three conductor trunks are not overly expensive, but if it was necessary to run three conductor trunks to a distant office the expense would be burdensome.

In order to be able to use two conductor trunks between offices it is necessary to introduce a new piece of apparatus called a Repeater. This Repeater is not a voice repeater, such as a repeating coil, but the name is derived from the fact that it "repeats" the dial impulses to the switches in the distant office. There are no mechanical parts in the ordinary repeater, it consisting merely of a group of relays.

In Fig. 28 a telephone is shown connected to a primary line switch which has access to a secondary line switch, which in turn has access to a first selector. The second level of the first selector banks lead to a group of local second selectors. The fourth level in the banks of the local second selectors go to a group of connectors in the originating office. The sixth level of the first selectors is carried to a group of repeaters, each repeater being associated with a two conductor trunk which terminates on an incoming second selector at the distant office. The third level of the incoming second selectors in the distant office is shown as leading to a group of connectors. In the originating office a group of incoming second selectors are shown whose banks are multiplied with the banks of the local second selectors The incoming second selectors in the originating office are the terminals of a set of repeaters which may be seized from the second level of the first selector banks in the distant office. The sixth level of the first selectors in the distant office is led to a group of local second selectors the banks of which are multiplied with those of the incoming second selectors.

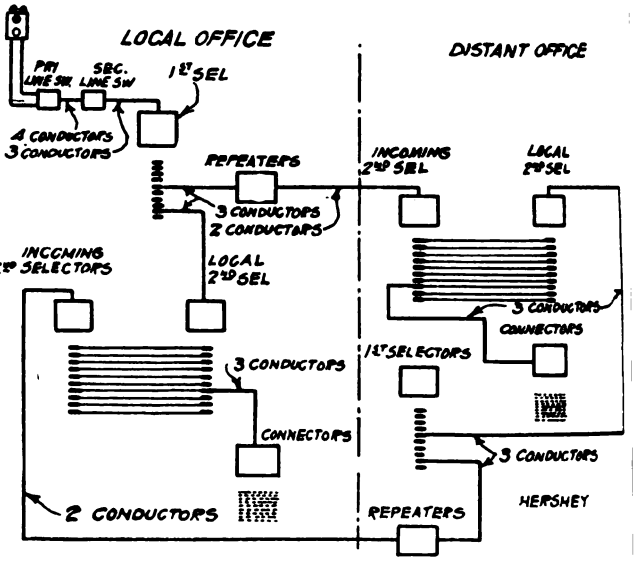

FIG. 28. MULTI-OFFICE SYSTEMS

If a party in the local office calls the number 2486, the first selector will step up 2, the local second selector will step up 4, and the connector will complete the connection. If 2486 is called from the distant office the first selector will step up 2, the incoming second selector (at the local office) will step up 4, and the connector will complete the connection. Should the number 6386 be called from the local office the first selector will step up 6, the incoming second selector (at the distant office) will step up 3, and the connector will complete the connection. Should the number 6386 be called from the distant office the first selector will step up 6, the local second selector will step up 3, and the connector will complete the connection.

From the foregoing it can be seen that the local office is the 2000 office, and the distant office is the 6000 office. While only one connector group is shown in each office it is to be understood that the ultimate capacity of each office is 1,000 lines.

Aside from the saving made possible by the use of a two conductor trunk, the repeater is of value in that the calling subscriber is fed talking battery from the local office, even though the connection is extended to a distant office. This is of great importance where common battery transmitters are used.

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QUESTIONS

A. Why is it necessary to multiply the banks of the local and incoming second selectors?
B. Why is it necessary to have a four conductor trunk between the primary and secondary line switches?

(*To be continued*)

STUDENT'S COURSE IN TECHNICAL TELEGRAPHY

By LOUIS CASPER

Lesson 36

In the preceding lesson the importance of effectually impressing a signal at the very outset upon a wire was explained. Since the entrance of the current into the line is effected initially through the medium of two metallic points or contact surfaces coming together, it would be well to discuss still further the nature and adjustment of the latter.

CONTACTS

In years past practically all contacts used for local or main line operation were made of platinum. The continued advance in the price of this material has restricted its use at the present time to main line high speed work, and for such purposes where a high degree of efficiency together with the utilization of a comparatively small cross-section of metal is required. For the operation of local relays, repeating sounders, polechangers and transmitters in Morse circuits, coin silver contacts are generally employed, the latter being somewhat harder than the pure metal.

The use of platinum for contact points is especially desirable because it is a heavy refractory metal and is not readily oxidizable. For this reason the contact surfaces of platinum accumulate but little oxidizing material resulting from current flow of greater or lesser values. The accumulation of this latter substance at the points of contact act as a resistance medium to the flow of the current.

Platinum as it is used in modern telegraph practice is combined with iridium, the proportion of the alloy being 85 per cent. platinum and 15 per cent. iridium. This greatly adds to the efficiency of the metal, rendering it harder and still further non-oxidizable. It will be recollected that iridium is used in the tips of gold pens so as to produce thereon a very hard surface, and when iridium is combined with platinum in the proportions given it has practically the same effect.

Coin silver, while a good metal for contact points, does not compare either in the ability of withstanding the oxidizing effects of current flow or in hardness, and is, therefore, not generally used where rapid transmission or absolute precision of signals is required.

Contacts made of tungsten are used for certain purposes with much success. This metal possesses a considerable degree of hardness, so hard in fact as to be impervious to filing. It is found to be an excellent substitute for platinum in pointing telegraph keys, for the reason that the pressure exerted by the hand upon a telegraph key is sufficiently great to overcome the high resistance created at the contact points when this metal is employed.

Tungsten contacts are also used largely for local work in the various units of the Multiplex and Morkrum printing telegraph systems. This metal, however, is not applicable for instruments that transmit main line signals directly, owing to the high resistance medium created when the contacts are lightly brought together, which is necessarily the case of practically all types of polechangers and transmitting relays. There are also other mechanical difficulties in the manufacture of these contacts which preclude their use for high speed direct line transmission.

CONTACT ADJUSTMENTS

The next item of importance in the transmission of line signals is the proper adjustment of the armature in relation to its contacting members, whether it be the armature of a transmitting relay typically used for repeater service, or a polechanger, the latter being either of the manually operated or tape controlled types. This adjustment in addition to the proper alignment of contacts as explained, calls for the accurate "centering" of the armature. In the case of a polechanger this adjustment is obtained by regulating the retractile tension of the armature so that the time relation or periodicity of contact is precisely the same on the back stop as it is on the front contact. With the repeating type relay a movable carriage is provided carrying the contact posts in such a manner that the air gap between the armature and the spacing side can be made greater or less than that between the armature and the marking side when the armature is in a position midway between the contact posts. Whenever the periodicity of contact is greater on one side than at the other, a condition results in what is known as a "bias." This may be either a "spacing" or a "marking" bias. A bias is indicated by the position of the needle of the differential milammeter at the distant terminal when reversals of current polarity are being transmitted from an automatic transmitter or the continued vibration from a semi-automatic sending machine. This indication manifests itself by a hang of the needle to one side or the other of zero; or the bias may be indicated by "lines" which are dots run

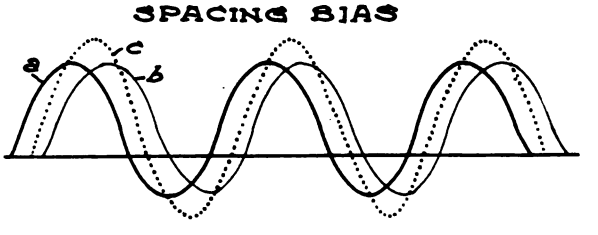

FIG. 101

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together or "drop outs," as the case may be on a tape recording instrument at the receiving end. The bias is due, as already stated, to the uneven duration of contacts on one side of the armature or the other. When the distant transmitter is reversing at a high speed and the duration of the contacts is practically even, the pulsations of current will, owing to their rapidity and uniformity of strength, not noticably vibrate the needle of the milammeter, for the simple reason that the inertia of the needle, that is, its disposition to remain at rest, is not overcome; or, in other words, before it

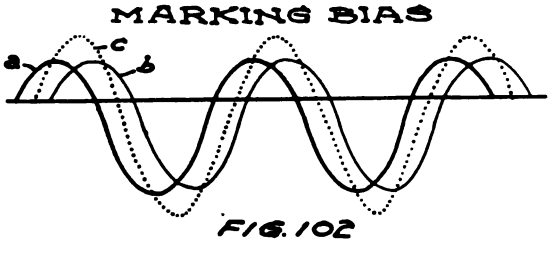

FIG. 102

can respond to the impulse to move in one direction, it is met with an equal impulse to move in the other direction. But, when, by reason of an uneven contact at the transmitting end, the current from one pole of the battery is of longer duration than that of the other pole, the needle obeys the more prolonged impulse, and tends to hang to one side of zero, as before stated.

The form of biased signals as transmitted is shown graphically in Figs. 101 and 102. The sine wave *a* in Fig. 101 represents the impressed e.m.f. which has a greater periodicity on the positive or spacing side than that on the marking or negative side. This results in the formation of the current wave *b,* which lags behind the e.m.f. but possessing similar characteristics of the latter. The resultant or power wave *c* is shown in dotted line, which is the actual operating signal passing on the wire. In Fig. 102 the bias has a marking inclination; hence the preponderance of the size of the curves below the zero line.

The effect of a bias either to marking or spacing is quite apparent in signal transmission. This manifests itself immediately by a reduction of operating margin of the circuit, at least in the direction that is followed by the signals, having a bias. When the bias is quite pronounced the signals become "tailed" or "drop out" as already indicated.

The tendency of a bias is to become accumulative in its effect. This is observed quite forcibly in the operation of long circuits, especially such wires that operate through repeaters. A curve is shown in Fig. 103 which is a typical case illustrating the upward trend of the bias curve which originated at terminal T with 5 degrees declination, gradually increasing in its cumulative effect to almost 15 degrees as the reversal of current passed each respective repeater station and is finally recorded at terminal T.

To attempt to correct this bias other than at the place where the latter originated and doing so at one or more of the repeater stations by means of a readjustment of the relays at these points would result in throwing such instruments out of their correct "centre," thus reducing the receptive efficiency of the latter in direct ratio to the extent of that readjustment. This as a consequence would have a tendency to reduce the operating margin of the circuit.

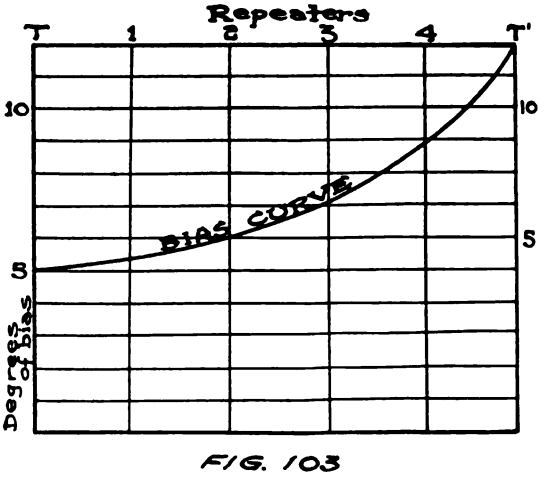

FIG. 103

A bias is not always caused by an improperly adjusted transmitting medium, although this appears to be a prolific cause for this kind of trouble. A bias may be caused by:

(a) Unequal battery potentials.

(b) Unequal battery lamp or unit resistances in the battery leads.

(c) Earth potentials.

(d) An unbalance at the receiving terminal.

(e) Line leakage.

These will be taken up in their order in the next lesson.

NOTE: In Lesson 35, page 420, a typographical error occurred which was made to read "both contacting numbers."

This should read "contacting *members.*"

(*To be continued*)

A Knowledge of Phillips' Code an Asset to the Telegrapher

Phillips' Code, *Latest Edition,* a thoroughly tested code of abbreviations, arranged for telegraphic purposes and contemplating the rapid transmission of press reports; also widely used as an easily acquired method of shorthand. Revised and brought up to date, with supplement to August 1, 1921. The new edition contains about 700 additions to the older code, and is indispensable to the operator who aspires to the standard of proficiency required by press associations, which includes a knowledge of Phillips' Code. Flexible cover, vest pocket size. $1.25 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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Origin and Development of Radio Service in America

(*Continued from page* 415, *September* 16*th issue*)

If the American business man located in Chicago, St. Paul, or any place other than New York City, desires to avail himself of the Radio Corporation's direct wireless services, he finds no through arrangements or through tariff available. It is, therefore, necessary for him to correspond with the Radio Corporation in New York City in order to establish a credit arrangement and to outline to what cities in Europe, and to what registered addresses he desires to communicate via radio.

With these preliminaries completed he may then prepare a domestic message in Chicago, addressed to the Radio Corporation of America, at 64 Broad Street, New York, containing in the text, the message which he desires the Radio Corporation to extract and forward to London, Paris, Berlin, or elsewhere. For this domestic telegram, prepared on the usual telegraph blank and filed with one of the domestic telegraph companies, he must pay the prevailing domestic tariff between Chicago or other place, and New York City. When the domestic message is delivered to the Radio Corporation by one of the domestic telegraph companies, the address must be removed and a new code address and destination inserted in the proper place by the Radio Corporation. After this is done the message is forwarded to its destination at the published tariff from New York City.

When the Chicago business man's correspondent in London, Paris, or Berlin desires to send his reply via radio he finds a through tariff quoted from the point of origin in Europe to Chicago or other American city. After dispatching his message it is received by the Radio Corporation at one of its high-power stations on the Atlantic coast and is received at central telegraph office in New York City.

The message is then transferred by messenger to a domestic telegraph office and it is forwarded by that company to Chicago, or other city served by their land-line system. The message as delivered appears on the well-known telegraph blank in the form originally filed at the point of origin in Europe, and usually carries the indication "via Marconi," so that the addressee is aware that his message crossed the Atlantic by radio. All messages received from Europe by radio are forwarded to their destinations in the United States as through messages at through tariffs. This is not true of messages intended for radio transmission to Europe which originate in the United States outside of New York.

For the American land-line service rendered on radio messages received from Europe, destined to points outside of New York City, the country is divided into four zones, the first zone including the North Atlantic seaboard States; the second zone extending west as far as Wisconsin, Illinois, Kentucky, Tennessee, and Missouri; the third zone covering the West to Montana. Wyoming, Colorado, and New Mexico; and the fourth zone covering the western portion of the country. The rates charged the Radio Corporation by the Western Union Telegraph Company for delivering messages in the four zones indicated are: First zone, 4 cents per word; second zone, 7½ cents per word; third zone, 11 cents per word; fourth zone, 14½ cents per word.

The service to Hawaii and the Far East, which includes Japan, Chosen (Korea), and Formosa, is centered in San Francisco, where is maintained a central telegraph office at 300 California Street. The sending station is located at Solinas, and the receiving station at Marshall, both places located about 30 miles north of San Francisco, and both stations directly connected by leased lines with the central telegraph office in San Francisco. These stations work with corresponding stations owned and operated by the Radio Corporation located on the island of Oahu, Territory of Hawaii. The receiving station is located at Koko Head, some twelve miles from the city of Honolulu, and the transmitting station is located at Kahuku, some forty miles from Honolulu. Both stations are connected and also directly with the central telegraph office in the business section of Honolulu, at 923 Fort Street. The stations in Hawaii are actually double stations. They have twice the power and twice the complete equipment of stations located in California. This is necessary in order to maintain continuous communication in two directions simultaneously. It is therefore possible to transmit a message to Japan on one antennae and at the same time transmit another message to California in the reverse direction on a second transmitting antennae. Similarly, at the receiving station, which is also of the double variety, it is possible to receive a message from Japan and another message from California at the same time.

If the business man in New York City desires to send a message to Japan via the trans-Pacific circuit of the Radio Corporation he can do so by filing the message with any office of the Western Union Telegraph Company, where a through rate to Japan will be quoted and the message would be forwarded over the land-line system to San Francisco and there transferred to the Radio Corporation for immediate reforwarding by radio. The message will pass as a through message without change being necessary at San Francisco. A message in the reverse direction from Japan destined to New York City would be handled in exactly the same manner and would be delivered by the Western Union Telegraph Company on its own blanks. The tariff from San Francisco to Japan is seventy-two cents per word for ordinary commercial messages. The tariff by cable is ninety-six cents per word. The through tariff from New York City to Japan via the Radio Corporation's service is 87 cents per word; via cable, $1.08 per word.

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Many messages received from Europe via radio are destined to Central and South America, and such messages are transferred at New York City as through messages to the All America Cables (Inc.). The combined transatlantic radio tariff and cable tariff of the All America Cables (Inc.) is somewhat lower than the tariff quoted in Europe for transatlantic cable transmission, combined with cable transmission south of New York City.

The business man in Argentine, Chile, Peru, or in any of the countries served by the All America Cables (Inc.), desiring to send messages via North America to Europe finds himself free to use an all-cable route to Europe or a route composed partially of the cable service of the All America Cables (Inc.), combined with the transatlantic radio service of the Radio Corporation. These two distinct routes are available to the South American at through tariffs, and his messages are handled as through messages. The tariff by radio is somewhat cheaper than the tariff by cable.

For communication purposes, the Radio Corporation of America is licensed under all of the patents present and future acquired by the British-Marconi Company, and likewise the British-Marconi Company is licensed for communication purposes under the patents, present and future, of the Radio Corporation of America. These licenses, of course, are limited to the United States in the case of the Radio Corporation of America and to the British Empire in the case of the British-Marconi Company.

The situation with respect to South America is this: The patent rights of the British-Marconi Company and of the Radio Corporation of America are to be transferred to a company to be known as the Radio Corporation of South America, which so far as these companies are concerned will do the radio overseas business of South America. The South American company, for example, will have a traffic contract with the Radio Corporation of North America for communication between North and South America. The South American company will have a traffic contract with the British-Marconi Company for communications between South America and the British dominions.

The capital of the South American company is to be provided one-half by the British company and one-half by the American company, but the contract provides that the board of directors of the South American company shall consist of seven, five of whom shall be named by the Radio Corporation of America, and two of whom shall be named by the British-Marconi Company.

It is also further understood and agreed that the construction, management, and operation of the South American stations shall be through their majority of the board of directors of the South American company in the hands of the North American company.

Plans are now under way for the construction by the South American company of a radio station in the Argentine for the purpose of enabling communications to be established between the Argentine and North America and between the Argentine and the British dominions. Land was acquired in the Argentine for the construction of such a station and a concession was obtained by the American-Marconi Company prior to the formation of the Radio Corporation of America. That concession has recently been extended and additional land is being acquired.

The problem of establishing direct communications between the Argentine and North America and between the Argentine and Europe is not yet solved. Not only are the distances greater than are now being bridged by existing stations, but there seems to be great difficulty in getting these signals across the equatorial zone. Higher powers are required in transmission; greater disturbances exist. As a matter of fact, the engineers are able to hear in the Argentine the signals of any of the great existing stations of the world sufficiently clearly with such regularity as to make it possible to use stations of present capacity for regular communications with South America.

No one now knows how great power in a sending station will be required in order to establish reliable communications between North America and the Argentine without relay, or between Europe and the Argentine without relay.

It may be that the costs of such transmitting stations will be so great that the business available will not pay an adequate return on the investment. That question is being carefully studied. People who refer to a South American communication by radio as something which can be set up over night either are misinformed as to facts or speak entirely without responsibility.

The doubts on the technical side have been one of the causes for the delay in the construction of the Argentine station. Another cause has been the attitude of the British-Marconi Company. The board of directors of the South American company is to be divided in the proportion of five to the American people and two to the English. Ever since that original contract was executed, the British-Marconi Company has been endeavoring to change the terms so as to provide for an equal number of directors with the American company.

These negotiations, carried on both in Europe and in America, were finally concluded about December 1, on the visit to New York of Godfred Isaacs, managing director of the British-Marconi Company. It was agreed that the contract might be changed so that the South American company should have a board of nine directors, five of whom should be nominated by the American and four of whom should be nominated by the British. Otherwise the contract remains unchanged. The management and control of the stations is still to be in Americans' hands, although the British are to contribute one-half of the capital investment.

In view of the very large capital expenditure necessary for an adequate station in the Argentine,

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it is hoped that the understanding with the British for co-operation may be enlarged so as to include also the French and Germans, because, obviously, the situation will not permit, under the present engineering practice of duplication of investment through duplicate stations. There is, of course, a possibility of a relay station, located either in the northern end of South America or in some of the islands of the Caribbean, but relay stations should be avoided if possible.

It is the purpose of the South American Radio Corporation, after it constructs a station in the Argentine, to construct a station in Brazil, and also one or more on the west coast. How soon such stations can be constructed will depend largely on the experiences in the Argentine. It is substantially the South American situation and the proposed program.

(*To be continued*)

———o———

Frank T. Viles Becomes a Forty-Niner of the Telegraph

Frank T. Viles, of the Postal Telegraph-Cable Company, Boston, Mass., has just rounded out his forty-nine years in the telegraph service, and he considers himself, in consequence, a forty-niner of the telegraph. The term forty-niner, previous to twenty years ago, related to those members of the profession who were employed in the telegraph service in the forties. There are so few of the original forty-niners of the telegraph alive today, that many members of the profession think that it would only be fair to the future generation to call as forty-niners, those who were engaged in the telegraph service forty-nine years ago or longer. This, of course, would make the forty-niners of the telegraph perpetual, and their number would run into thousands.

The suggestion of Mr. Viles to perpetuate the forty-niners of the telegraph is, therefore, a valid one.

Mr. Viles was born at Waltham, Mass., in 1856, and learned telegraphy in 1872 at the same place. He was in the service of various railroad and telegraph companies until 1880, when he became identified with the Western Union staff at 195 Broadway, New York. In 1882 he returned East and held many important positions in and around Boston. For fifteen years he had charge of the sixty Western Union branch offices at the Hub. Mr. Viles is the inventor of an improved switchboard and has a penchant for architectural drawing, which enabled him to remodel many of the branch offices to make them particularly attractive to customers

In this connection, Mr. Viles writes as follows: "I became a forty-niner this year. My first day in a telegraph office was March 18th, 1872, at Waltham, Mass., where I learned to make " e i s h p 6" and satisfied myself by letting the register run that I made them right.

Professor Morse died that spring, for I recall that Miss Hawkes, our manager, draped with black and white ribbon a steel engraving of him, which hung on the office wall.

My first regular employment as operator began July 8, 1872, at Concord, Mass., which was also equipped with a Morse register, or I could not have filled the position, for I did not discard the register until about Christmas time of the same year.

One of our almost daily callers there was Ralph Waldo Emerson, whose morning walk usually included the post office and the depot, for a chat with the agent and operator.

It is one of the odd things of life that the little details of one's first venture stand out more distinct than the many incidents of later ones which have almost faded from memory.

We read a lot in the public prints nowadays about Myles Standish, Priscilla Mullins and John Alden, and twice within a month, although I hadn't seen him for nearly twenty years, I ran across Charles Alden of Duxbury, Mass., a descendant of John Alden of *Mayflower* fame. Old Timers of New York doubtless remember him at 195 Broadway. When the Duxbury cable failed, the operators would be transferred to New York or elsewhere until it was restored. Mr. Alden lives in retirement at Duxbury."

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A Recollection of an Old Timer by One of Them

I shall never forget a strange message which I nearly received in my early telegraphic career. I was a ham—how bad I cannot say, but I must have been very rank. It was a cold, windy night, in the middle eighties. Snow was falling fast and the wind was howling. The hour was nearly ten, the closing time of the office. I was alone and subbing for the manager of a small office of the old United Lines Telegraph Company in central New York. Everything inside was quiet except the clock with its incessant tick-tock, tick-tock. The scene was a fitting one for what was to follow. New York began to call. At first I was tempted to cut out, turn out the lights and lock the office, but finally I answered. Slowly and distinctly came the following in the finest Morse I had ever heard: "Am dead. Will be buried to-morrow. Answer to the cemetery." The check, place from and address I have forgotten—the signature I never received. It came like lightning, or so it seemed to me at that time. I made my first "break." The sender let loose with a long string of what must have been something uncomplimentary, because I got the word "Ham," but that was about all. I did not break him, nor did I answer when he again called. I only laughed, turned out the lights and went home. The joker may have forgotten the circumstance or he may have passed on, but I shall never forget the message I nearly received.

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Magnetic Storms—Their Effects Upon Railway Signal and Telegraph Apparatus*

*Abstract of paper read at the Institution of Railway Signal Engineers (Inc.), by Mr. W. J. Thorrowgood, signal and telegraph superintendent, London & South-Western Railway.

The effects of magnetic storms on railway telegraph apparatus, such as single needle, Morse, duplex, quadruplex and telephone single-wire circuits, have been noticed on very many occasions, rendering signaling almost impossible.

Records of the value and direction of these currents have been taken by some railway companies, notably the Midland Railway Telegraph Administration. But the difficulties in obtaining actual measurements in the cases of tablet or block circuits are very great, owing to the fact that the circuits are mostly isolated, and in the majority of cases practically impossible to get at, to take measurements while the storm is on. Further, it is not desirable to interfere with these circuits at such times any more than is necessary.

Fortunately, local circuits have not been so frequently interrupted by these currents as through or long circuits have. This, however, depends upon the intensity of the magnetic storm. The severe magnetic storms during 1919-1920 were strong enough to generate currents sufficient to affect many local or comparatively short circuits, such as signal arm repeater circuits, which are considerably under one mile in length. In all cases inconvenience and delay have been caused, but if tablet, staff, block, or lock and block instruments are interfered with, the consequences may be serious.

Through the kindness of the engineer-in-chief of the Post Office and various railway companies' telegraph engineers, in supplying measurements and particulars, the author has prepared tables, which show the extent and importance of the subject.

The currents actually measured on railway signal and telegraph circuits vary from 8 to 33 milliamperes, and voltage from 13 to 53 volts. The interference is not due altogether to the earth's magnetic field acting magnetically on the armatures or needles of telegraph apparatus, as in the case of s.n. telegraph instruments; if the circuit is disconnected the needles tend to return to normal. There may be some influence magnetically due to the variations in the earth's field, but the major part of the interference is due to currents in the circuits.

The currents passing over the wires during magnetic storms may be due to one of many causes, for instance:

1. The effect of the energy discharges from the sun may be to raise the potential of the earth itself electrostatically at one point (or area) above the surrounding areas, and in the endeavor to establish equipotential, currents flow through the earth and every other conductor that offers a convenient path.

The author has calculated that the total currents passing through the earth between observing stations (the distance between which varies from 3 to 350 miles) may be anything from 5 to 225 amperes.

2. The effect may be due to the changes in the earth's magnetic flux (in or surrounding the conductor) acting inductively on the wire. This view necessitates a continual alteration in the magnetic lines of force, or flux, across the conductor to maintain the potential difference, and the author gives the absolute value of the earth's magnetic field and rate of change per second to generate the currents observed. He also gives the strength of the earth's magnetic field per sq. cm. in the area enclosed between the surface of the earth and the wire above the surface of the ground.

3. It may be that the ions driven off from the sun bombard, as it were, the earth at certain parts, the conducting wires become electrically charged at that place, and the electricity passes to earth over the conductor. It may be that the electricity flows from the charged spot towards both ends of the wire to earth at the same time; thus there may be two currents in the circuit passing in opposite directions from the charged part.

The currents due to magnetic storms on August 11th, 1919, and March 22nd, 1920, caused a release or false clear indication to be received on practically every form of block, lock and block, tablet, staff and block bells in use on English railways, but there is no case recorded where a signalman actually acted upon the false signal, although it is obvious that he was free to do so had he disregarded the block instructions.

A summary of the Post Office records of currents due to magnetic storms between August 1st, 1919, and April 1st, 1920, a period of eight months, during which 18 magnetic storms, or an average of 2.25 per month, were recorded, is given in the original paper.

On ten days the observed currents were 25 m-A, or over, to 56 and 150 m-A on March 23rd, 1920, which may be called dangerous magnetic storms, or 1.25 per month on an average.

The areas over which the magnetic storms are experienced are very great. On August 11th, 1919, magnetic storm effects were felt all over Great Britain and Ireland, and the maximum current values observed varied from + 150 to — 60.

The merit of the author's tables is that the records of the currents and e.m.f. recorded, have actually been measured during magnetic storms, and the resistances measured.

The special feature concerning the magnetic storm on August 11th, 1919, was its sudden appearance and its effects upon comparatively short circuits (such as signal arm repeater circuits) which had not been noticed previously; a current of 50 m-A was recorded on a circuit 13 miles long between Ambergate and Mansfield. A summary of the record of the number of days the earth's magnetic field was disturbed and the comparative extent of the daily disturbances during the years 1918 and 1919, shows that the number of magnetic disturbances vary from year to year. In 1918 disturbances were observed on 211 days; on 13 days the

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disturbances were great, and on 8 very great. In 1919 on 253 days magnetic disturbances were recorded; on 21 days the disturbance was great, and on 18 days very great; thus in 1919 there were 2.25 as many days when the magnetic disturbances were "very great" than in 1918. During the magnetic storm in August, 1919, the declination of the earth's magnetic field varied from 13° 44′ W. to 15° 49′ E. The vertical force varied 935y. The north force varied 840y. During the storm in March, 1920, the declination varied from 13° 35′ to 14° 54′. The vertical force varied 820y. The north force varied over 810y.

Circuits having no connection with earth (that is, having metallic returns) are practically immune from the effects of currents due to magnetic storms. Mr. Stevenson, of the Caledonian Railway, states:

"None of our block, train tablet, or train signaling telegraphs were interrupted in any way, as they are practically all now on return wire circuits," although some of the s.n. telegraph circuits on that railway were disturbed to a certain extent. The records show that some metallic circuits have been affected, but very slightly, compared with the effects observed on earth-connected circuits.

The complete and safe remedy therefore appears to be to provide metallic returns for all circuits. This does not of necessity mean that a return wire will have to be provided for each circuit, as a common return wire can be used for all circuits over certain lengths, but the distance between the conductor and return should be as little as possible. It is best to sectionalize common return wires, owing to the difficulty of tracing faults, also to the lowering of the insulation resistance of the whole of the circuits, when only one common return is used over a large area. If a common return wire is provided the resistance of the instruments should be as high as possible.

The currents due to magnetic storms or stray earth currents may be reduced by increasing the resistance of the circuit and keeping the sensitiveness of the electric signaling instruments the same as at present. The question arises what value of resistance should be added to the circuit to ensure that any magnetic storm current would not affect the apparatus? Probably 200 per cent. increased resistance would give a sufficient factor of safety to render the circuit safe from dangerous interference. It would, of course, be necessary to increase the battery power at each station to correspond with the increased resistance to give the working current for the instruments on the circuit.

It may be put forward that owing to the infrequency of magnetic storms the expense of providing return wires would not be justified, but there is a danger that, owing to their infrequency, a false signal given by a magnetic storm may not be recognized immediately.

A third method of lessening the effects of magnetic storm currents would be to issue special regulations to signalmen, and rely upon the men to notice any irregular working of the apparatus.—*London Electrical Review.*

The Washington-Greenwich Longitude

By Rear Admiral W. H. G. Bullard

The Washington-Paris longitude given in the American Ephemeris and Nautical Almanac from 1901 to 1915, $5^h\ 17^m\ 36^s.75$, is correlated with the Paris-Greenwich longitude, $0^h\ 9^m\ 20^s.97$, which has been superseded by the value given above, corresponding to a Washington-Paris longitude of $5^h\ 17^m\ 36^s.71$. This depends on the adjustment of the Washington-Greenwich longitude made by Schott in 1897, which gave for that longitude $5^h\ 8^m\ 15^s.78 \pm 0^s.05$. Schott's value was based largely upon the result of the 1892 cable determination of the difference of longitude between Montreal, Canada, and Greenwich, for the result of which only the preliminary value was available when the adjustment was made. The definitive value gave a correction to the preliminary value of $-\ 0^s.05$, indicating that Schott's value of the Washington-Greenwich longitude is somewhat too large. Assuming the value given above for the Greenwich-Paris longitude, and combining with it the Washington-Paris longitude resulting from the present determination, the following value is obtained for Washington-Greenwich:

$$5^h\ 8^m\ 15^s.721 \pm 0^s.014.$$

The French authorities have proposed that an extension of their first experiment be repeated with other stations, and it will be interesting to see how near the difference of longitude carried around the world will check up to 24 hours.

On account of the depreciation in the value of foreign moneys, telegraph tariffs between various European countries are undergoing frequent adjustments. A decree of August 4th decided that foreign telegram rates, hitherto fixed by the Telegraph Administration of France in gold francs, should in future be fixed in "French francs," that is to say, at the current value of the franc, which is considerably less than that of the franc at par. An average equivalent of one franc 80 centimes for the French franc, as compared with the gold franc has been decided upon, though this figure is susceptible to alterations in accordance with variations of the rate of exchange. Thus a telegram to London (ten words at the ordinary rate), which formerly cost 2 francs 50 centimes, will now have to be multiplied by 1.8, costing 4 francs 50 at the new rate. A ten-word telegram to Switzerland (formerly costing 1 franc 50) will now cost 2 francs 70, and so on.

George A. Low, Sr., a member of the United States Military Telegraph Corps during the Civil War, now and for many years with the Postal Telegraph-Cable Company at Pittsburgh, writes: "I still retain my interest in the telegraphic fraternity and often live over in memory the stirring days of '61 to '65. I desire to express to you my appreciation of your interesting paper."

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Carrier Current Telephony and Telegraphy

By E. H. Colpitts and O. B. Blackwell

(A paper read at the Cleveland Session of the Telegraph and Telephone Section of the American Railway Association on September 22nd)

In the April, May and June numbers of the *Journal of the American Institute of Electrical Engineers,* is given a fairly complete statement as to the history of this art, the fundamental principles which underlie it and the apparatus and methods which have been developed for carrying it out. We would refer you to that publication for a more detailed statement than is given here. In the present paper we are emphasizing certain features which we think will be of particular interest to you.

First of all, let us make sure that we have the proper physical conception of carrier current transmission and understand the characteristics which differentiate it from ordinary wire transmission on the one hand, and from radio on the other. Starting with fundamentals, we all know that ordinary telephone and telegraph circuits make use of electromagnetic waves guided by wires. The wires play so important a part that we are likely to think of them as actually conveying the electrical energy As a matter of fact, however, the energy is largely transmitted outside of the wires. To illustrate this we are indicating in Fig. 1 a cross-section of two

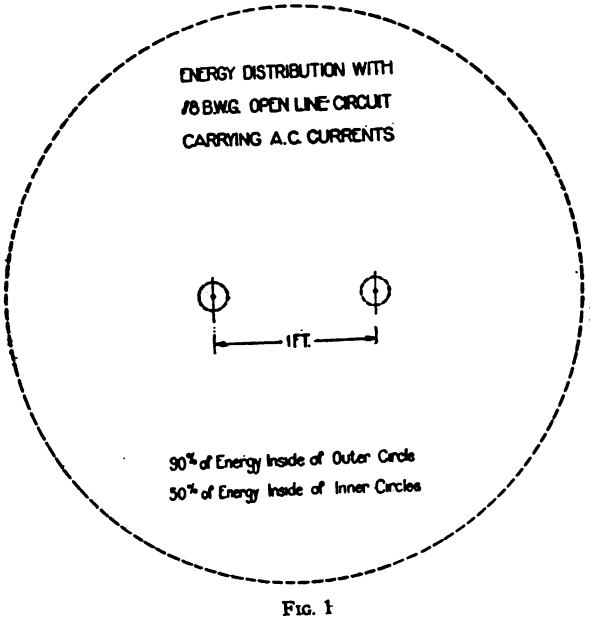

Fig. 1

(2) copper wires of the size used in the longest telephone circuits and spaced the usual twelve (12) inches apart. These wires weigh four hundred and thirty-five (435) pounds per wire mile. One large circle and two smaller circles have been so drawn on this diagram that 50 per cent. of the energy transmitted over the circuit is transmitted within the inner circles. Forty per cent. is transmitted between the inner and outer circles, and 10 per cent. outside of the outer circle. The amount transmitted in the wire itself is negligibly small. (Energy dissipated in the wire should not be confused with energy transmitted in it.)

Now in the carrier system the electromagnetic waves are transmitted in just the same manner as those in the ordinary telephone circuit, although they are generally of higher frequency. The same circles in Fig. 1 show the distribution of energies around the wires for carrier currents. Both carrier and ordinary telephone and telegraph, then, use wire guided electromagnetic waves and do not differ in the mode of transmission over the line.

The difference between them lies primarily in the form given to the electric waves which carry the messages. In the ordinary telephone system, as you know, a direct current is allowed to flow through a microphone transmitter, and the frequencies of the voice vary the resistance of the transmitter in such a way that the amount of direct current flowing rises and falls in accordance with the voice variations. In the ordinary telegraph, a direct current is again used and this is broken up into dots and dashes by the opening and closing of contacts. In the carrier system a very similar process goes on, except that instead of using a direct current, an alternating current is used, the volume of which is controlled in accordance with the variations of the telephone or other message being transmitted. In the ordinary system, then, we can say if we wish that we modulate a direct current. In the carrier system we modulate an alternating current. An alternating current on which the signaling variations are thus impressed has come rather naturally to be regarded as the "carrier" of the signaling variations, and, therefore, to be designated as the "carrier current." Thus, the system has come to be designated as a "wire-carrier system," or, more simply, as a "carrier" system. It is the use of the carrier principle which results in the very important advantage that several messages can be transmitted over one circuit. This follows from the fact that carriers of different frequencies can be chosen for the several messages and that the frequencies which result from modulating these different carriers, may all be put together on a telephone line and separated out at the terminals by means of electrical apparatus designed to distinguish between currents of different frequencies.

So much, then, for the differences between carrier and ordinary telephone and telegraph circuits. Comparing either of these with radio, we find there is the fundamental difference between guided and unguided transmission. The characteristic feature of radio is, of course, that the waves are unguided. Even when sent out with a certain degree of directivity, they spread out over a wide area, and impinge on all the radio receiving stations in that area. Radio is then an unguided broad-casting method of transmission. In wire transmission, however, the wires guide the waves, prevent them from spreading, and deliver them to the one desired receiving point. The conducting wires form electrical paths for the waves. These paths may be carefully ad-

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justed to have the proper efficiency and stability and carefully balanced to minimize the amount of interference entering them and the amount of interference from them to other paths. This fundamental difference should be carefully kept in mind. It is unfortunate that the term "wired wireless" or "wired radio" has to some extent been applied to the wire carrier system of transmission. Such terms say in effect, "guided-unguided" transmission. They contradict themselves.

In thus distinguishing between carrier and the other related forms of transmission we have touched on the fundamental principles which underly the carrier systems. Looking at them in more detail, we find that they involve first "modulation." This is the process which we have already discussed, in which the amplitude of the alternating current which forms the "carrier" is made to vary in accordance with the variations of the voice or telegraph signals. For telegraphy this change in amplitude amounts simply to breaking up the carrier current into "spurts" of alternating current interspersed with intervals of no current.

The American Institute of Electrical Engineers' paper shows in detail that if all unnecessary frequencies are suppressed, modulation amounts simply to a stepup in frequency from the voice or signaling range of frequencies to any other desired range of frequencies. For example, if the voice varies in frequency from 300 to 2,500 cycles, then this may be modulated on a carrier so that the currents sent out over the line consist of frequencies ranging from N + 300 to N + 2,500 cycles, where N represents the frequency of the carrier.

"Demodulation" consists of the reverse process of stepping back in frequency, thus giving back the original telephonic or telegraphic signals.

"Selection" is the third characteristic feature of carrier systems. This involves the use either of resonant electrical circuits for telegraph systems, or of electrical filters for telephone systems. The electrical filter is a combination of coils and condensers so arranged that it will transmit any desired range of frequencies and practically shut out all frequencies outside of that range. By the use of filters at the terminals of a line, different electrical circuits may be set up so that the frequencies corresponding to the several messages may be led into separate channels. In this way the separate messages are diverted to different subscribers with no interference between them.

The methods used in arranging for two-way operation, and the methods of using telephone repeaters in carrier systems, are similar in principle to the methods used in the ordinary telephone transmission. Carrier repeaters involve most of the problems with which those who are operating repeaters are familiar, besides certain problems peculiar to the high frequency field. There are, however, two advantages of carrier repeater operation which should be pointed out. (a) All the telephone or all the telegraph channels on a pair of wires may be amplified together in a single repeater without being selected one from the other. (b) It is possible, but with considerable sacrifice in the number of circuits, to use carriers of different frequencies for transmission in the two directions, thus avoiding the need of careful line balance at the repeater points. It would, of course, be perfectly possible to make similar arrangements with ordinary circuits by using a separate circuit for transmitting in one direction from that used for transmitting in the other. This, however, cannot be justified commercially with ordinary open wire circuits, but can be justified in many cases with carrier circuits.

So much, then, for the general principles underlying the carrier systems. We will not undertake to describe the particular forms which have been given to the carrier apparatus, but will refer you to the American Institute of Electrical Engineers' paper for that. We had the pleasure a short time ago of showing both telephone and telegraph installations at Harrisburg to a number of railroad telegraph superintendents. We would be glad to arrange so that any of you who are interested could visit the installation there and see the systems in operation.

From the standpoint of an operating superintendent, the line end of the problem is of particular interest. The first thing we find here is that high frequency currents attenuate much more rapidly in traveling along the line. This is due principally to the larger effective leakage at these higher frequencies. For this reason it is necessary to insert carrier repeaters at comparatively frequent intervals along the line. In determining the distances between repeaters in any case the carrier currents are allowed to decrease in magnitude until they reach the point where, if permitted to become smaller, they would be interfered with by the slight disturbances which come into the line from static, from power systems, or from radio or other carrier systems.

Another problem which becomes of much larger importance in carrier operation, and which is perhaps the greatest difficulty in carrier transmission, is the effect of the short lengths of cable which it is impossible to entirely keep out of any open wire line. Such lengths come into the circuit in passing through cities or towns, at river crossings, etc. These short lengths of cable bring in very large high frequency losses, and also large electrical irregularities in the circuits at carrier frequencies. To overcome these difficulties as much as possible, loading has been developed and applied to cable circuit for carrier operation. It is necessary, however, to use special forms of coils and to space them less than 1,000 feet apart.

Another difficult line problem comes in when it is attempted to operate more than one carrier system on a pole line. The higher frequencies have a much greater tendency to pass from one circuit into another through the mutual capacities and inductances between circuits. This can be overcome as in ordinary circuits by transposing the different circuits against each other. The frequency of transposition

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and the difficulties of keeping the desired degree of precision are very much greater, however, with carrier systems. In some cases, even where it is attempted to operate a single system on a pole line, the amount of energy leaking into other circuits, without special transpositions, has been found sufficient to very greatly increase the attenuation loss in the carrier system.

The three problems noted previously, which are (1) increased attenuation, (2) increased effect of lengths of cable, and (3) increased cross-induction, all become greater as the frequency is increased. It is for these reasons that the frequency range below 30,000 cycles has been exploited for carrier use by the Bell System.

With a system before you of so great technical interest, the thought which naturally occurs to you is, "What use can we make of it in our railroad work?"

In the first place, the carrier system as it now exists, is essentially a long distance proposition. This follows from the fact that there is involved very expensive terminal apparatus, where the transformation is made from the voice currents or signaling currents to the high frequency carrier currents. When this transformation has been made, the cost of intermediate repeaters to extend the range to which the currents can be transmitted is comparatively small. Evidently it is not possible to economically place bridged stations on carrier circuits, since this involves again making the transition from the carrier frequencies to the voice or signaling frequencies.

An important part of the expense of a carrier installation is common to all the channels which are installed so that a channel placed singly would cost considerably more than would each of three or four channels put in at the same time. Carrier apparatus is necessarily complex and involves many features novel to an operating telephone or telegraph personnel. It is necessary, therefore, to build up a personnel having the necessary training in the special characteristics of these higher frequencies, and competent to maintain the new apparatus. For these reasons the telephone company is now considering carrier only for long distance service, such as Harrisburg to Chicago or Harrisburg to Detroit. The terminals here are in large offices, and the lines are along important routes so that the apparatus at the ends and the intermediate apparatus can economically be under the maintenance of specially trained and competent personnel.

The factors noted appear to make it difficult for the railroad companies to advantageously use carrier at the present time. We presume you cannot, in general, afford to maintain more than one or two long distance circuits along a route free from intermediate bridges. The trained and competent personnel would handle a comparatively small amount of such apparatus. We wish to say frankly, therefore, that in our opinion it would take an unusual railroad situation to prove in the present use of carrier apparatus. It is probable that this situation will change with further experience with systems under commercial conditions and with the further progress of development. With any art in which the commercial application has been comparatively short there is, as you know, a constant movement towards simplification and standardization. We can expect, therefore, that when the results of field and laboratory work under way and contemplated become available it will be found possible for the railroad companies to make important use of carrier methods.

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History of the Morse Statue in Central Park

By C. W. Gulick

I was greatly interested in the article entitled "History of the Morse Statue in Central Park," written by John Horn, the well-known old-time telegrapher, of Montreal, which was printed in Telegraph and Telephone Age, June 1st and 16th issues. I was one of the many that contributed to the fund to defray the expenses incident to the erection of the Morse Statue in Central Park in New York, and I was also present at the unveiling ceremonies. I was also a participant at the Academy of Music farewell reception to Professor Morse, given him on the evening of June 10th, 1871. The pen picture of the occasion which was made by the well-known artist of those days, D. T. Ames, is in my possession and I will send it to you to be placed in your archives. The picture shows Professor Morse at the key, sending his farewell message, which was printed in the June 16th issue, to all principal points in the United States. It is headed by the address of William Cullen Bryant at the unveiling of the statue erected in honor of Professor Samuel F. B. Morse in the Central Park of the City of New York, June 10th, 1871. It is a testimonial of the telegraphers of the world to Professor Samuel F. B. Morse, Honor to Whom Honor is Due.

Mr. Ames was in the early seventies one of the leading artists of New York, and the picture at the time was considered a wonderful production. That was long before the days of reproducing photographs by the half-tone process, such as are enjoyed today.

[It will be interesting to our readers to learn that Mr. Gulick is an old-time superintendent of construction. He was born in Pennsylvania, March 26th, 1839. He entered the telegraph service in 1862 as foreman of construction. He was next appointed chief of construction in the Army of the James and continued in this position during the Civil War. After the war had ended, Mr. Gulick built telegraph lines for various railroads, and telegraph companies, among the later being the Pacific and Atlantic, Atlantic and Pacific, Postal and the Western Union Telegraph Companies. His construction career covered a period of over fifty years in thirty-five States. Mr. Gulick is now living in retirement at White River Junction, Vt.—Editor.]

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The Kleinschmidt Printing System

First a Kleinschmidt Wheatstone Perforator accepted as standard in all parts of the world, then a simple, durable, high-speed type-bar printer, selected as the most efficient by the largest user of printing telegraph instruments in the world, and finally a complete system built up around this successful printer. These are the steps in the development of the Kleinschmidt Automatic Printing Telegraph System. The result is a system that is simple and reliable as well as economical.

The Kleinschmidt Wheatstone Perforator and the Kleinschmidt Printer need no introduction, but the complete Kleinschmidt printing system is a recent development. The purpose of this article is to describe briefly the general features of the system that have led to its adoption by leading commercial and cable companies, press associations and railroads.

Early in 1920, the Kleinschmidt system started the first successful commercial circuits operating at a speed of seventy-five words a minute, and since then the equipment has earned the distinction of handling messages over the fastest and longest press circuits, having as many as thirteen receiving stations. The system is filling the urgent need of an efficient and inexpensive means of long-distance communication. The additions being constantly made to the large number of Kleinschmidt machines now in use is evidence of the satisfaction they are giving in continuous high-speed service.

In order to send a message an ordinary typist operates the desired keys on the perforator, and inserts the perforated paper tape in the transmitter. As the tape is automatically fed through the transmitter, the proper signals are sent out over the line, to be received and interpreted into typewritten characters at the distant end.

The reception of a message is entirely automatic. A line relay operating in conjunction with the receiving distributor, sends the incoming line signals to the printer and the typewritten characters are printed in page form.

The printing is done by means of standard Underwood type-bars and the copy is therefore neat and legible.

The speed of the system may be varied anywhere from forty to eighty words per minute, so that the capacity of the system may be increased at any time by adding one more perforator, the transmitter and printer being amply able to handle the tape prepared by both typists during "peak load" periods. In this way a flexibility that cannot be had with slow speed sets may be attained.

A single line wire is all that is required between stations, the ground being used as a common return, and the line may be either simplexed or duplexed. A line relay is used, but this is the only relay used in the entire system. No relays are used in any of the units.

Both positive and negative line battery is used and 110 volts direct current is needed to operate local circuits.

The present Kleinschmidt Printer No. 4 is the result of years of experience and study and is the very heart of the system. It embodies the suggestions of Western Union engineers for improved operation and reduced maintenance, as the result of their experience with over 700 of previous Kleinschmidt models.

Western Union tests of the printer have resulted in runs of over 100,000 words without errors of any kind. It is relatively small and light and all mechanical motions are entirely free from harsh actions. Parts are built for long wear, and the printer is designed so that the wear and tear on parts is the same for every 1,000 words printed, no matter whether the printing is done at forty or eighty words per minute. There is no disadvantage therefore in speeding up the equipment whenever the rush of work demands such procedure.

When a key lever is operated, the tape moves to the left a distance sufficient to enable the operator to read what has been punched. The tape feeds in a horizontal direction in such a way as to minimize the amount of tape necessary between the perforator and the transmitter.

The outstanding feature of the Kleinschmidt transmitter is its simplicity. Only one contact is used for transmission and the mechanism is all direct-acting. The transmitting contact tongue is connected directly to the line wire and acts as a simple pole-changer, sending out positive and negative impulses, according to whether the vertical pins are blocked or not blocked by the perforated tape during their upward travel.

The code used is the Standard Western Union Baudot five unit code with a start signal and a time interval between characters. In other words, 7 unit length impulses are transmitted over the wire for each character. This means a line frequency of but 21 cycles per second at sixty words per minute and only 28 cycles per second at eighty words per minute, thereby permitting the equipment to be used over long or poor wires where operation with other systems using higher line frequences is impossible.

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China to Issue Bonds for Radio Stations

The Department of Communications at Pekin, China, has signed a supplementary bond issue for completing the Federal Company's wireless contract which long has been the subject of negotiations growing out of the Anglo-Japanese contention that it infringed their respective rights. The contract was signed January 6th.

The development in the situation on September 19th will permit of the Americans proceeding with the construction of a high powered plant at Shanghai and smaller stations at Harbin, Pekin, Hankow and Canton.

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EDITORIAL COMMENT

Million Voltage Sent by Wire for First Time

General Electric Company engineers at Pittsfield, Mass., on September 13th completed a series of high voltage tests, using one million volts for the first time in history.

The pressures were generated by transformer equipment designed along standard lines.

The success of these tests is the result of more than thirty years of constant experimentation. They confirm the belief of General Electric engineers that it will be commercially feasible to use considerably higher voltage in transmission of power and extend long distance transmission beyond a limit heretofore believed impossible.

Theodore N. Vail's Advent Into the Telephone Field

When Theodore N. Vail took the managerial reins of the telephone business, the telephone had been invented, constructed and introduced, but it was up to him to put it on a business basis, says the *Telephone Review*. In those days the nation-wide strength of the Western Union, enhanced by their possession of the superior Edison transmitter, made the life of the telephone pioneers a continued hardship and adventure.

But Theodore N. Vail, through his early association with Morse, and wide experiments in the U. S. Post Office Department, well fitted him to develop a telephone system.

One by one he mapped out the measures of the broad policy in effect today. In two months the first Bell Telephone Company was organized, with $450,000 capital and 12,000 telephones. He put the fighting spirit into every agent, built up a definite business policy, started a department to collect and protect any new invention concerning the telephone, and took steps to standardize all telephone apparatus.

Nevertheless, in the five months that followed, Vail and his little company had to fight every step of the way. Each day brought news of a deserter, a debt or a defeat. Officials, printing-telegraph men and capitalists were all against them, and it was with greatest difficulty that the pioneers succeeded in establishing the first lines. Today these lines stretch overland from coast to coast, under the sea to Cuba and by the development of radio-telephony the touch of the telephone is extended to distant islands and ships at sea.

All this public opposition was not conducive to the establishment of the business on a sound basis. However, the mail one day brought a letter from a young Bostonian, Francis Blake, with the good news that he had invented a transmitter as good as Edison's, which he would prefer to sell for stock instead of cash.

The possession of this transmitter not only put the Bell Company on an even footing with the Western Union, but encouraged the few who had invested and stirred others to come forward. In four months the company had twenty-two thousand telephones in operation. They reorganized into the National Bell Telephone Company, with $850,000 capital, and made Colonel Forbes their first president.

This reorganization closed the pioneering and experimental period of telephone history.

Ownership Statement

Statement of the ownership, management, circulation, etc., required by the Act of Congress, of August 24, 1912, of TELEGRAPH AND TELEPHONE AGE published 1st and 16th days of each month at New York, N. Y., for October 1, 1921.

State of New York,
County of New York,
ss.

Before me, a notary public in and for the State and county aforesaid, personally appeared John B. Taltavall, who, having been duly sworn according to law, deposes and says that he is the publisher of THE TELEGRAPH AND TELEPHONE AGE and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, John B. Taltavall, 253 Broadway, New York.
Editor, John B. Taltavall, 253 Broadway, New York.
Managing Editor, none.
Business Managers, none.

2. That the owner is:
John B. Taltavall, 253 Broadway, New York.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent. or more of total amount of bonds, mortgages, or other securities, are:
None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

JOHN B. TALTAVALL, Publisher.

Sworn to and subscribed before me this 22nd day of September, 1921.

[SEAL] JOSEPH R. FRITH.

(My commission expires March 30, 1922).
Notary Public, Kings County, No. 79.
Certificate filed in New York County, No. 182.
Kings County Register's No. 2078.
New York County Register's No. 2163.

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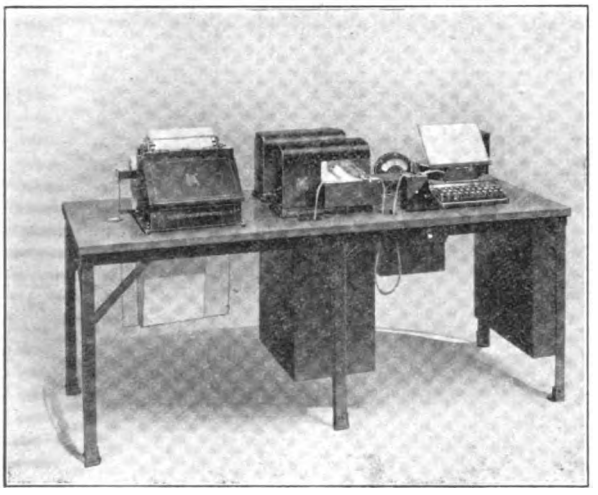
Kleinschmidt
Printing Telegraph System



The Kleinschmidt system is now ready for delivery on short notice.

It is speedier, simpler, more durable and dependable than any other similar system now on the market.

Your inquiries are solicited.

Kleinschmidt Electric Co.

Sperry Building Brooklyn, N. Y.

HALL SWITCH & SIGNAL CO.

Garwood, N. J. Chicago

MANUFACTURERS OF THE

GILL SELECTOR

THE UNIVERSAL SELECTOR
FOR
TELEGRAPH AND TELEPHONE

The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,

Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.
1205 Hobart Bldg., San Francisco, Cal.
2044 Railway Exchange Bldg., St. Louis, Missouri.

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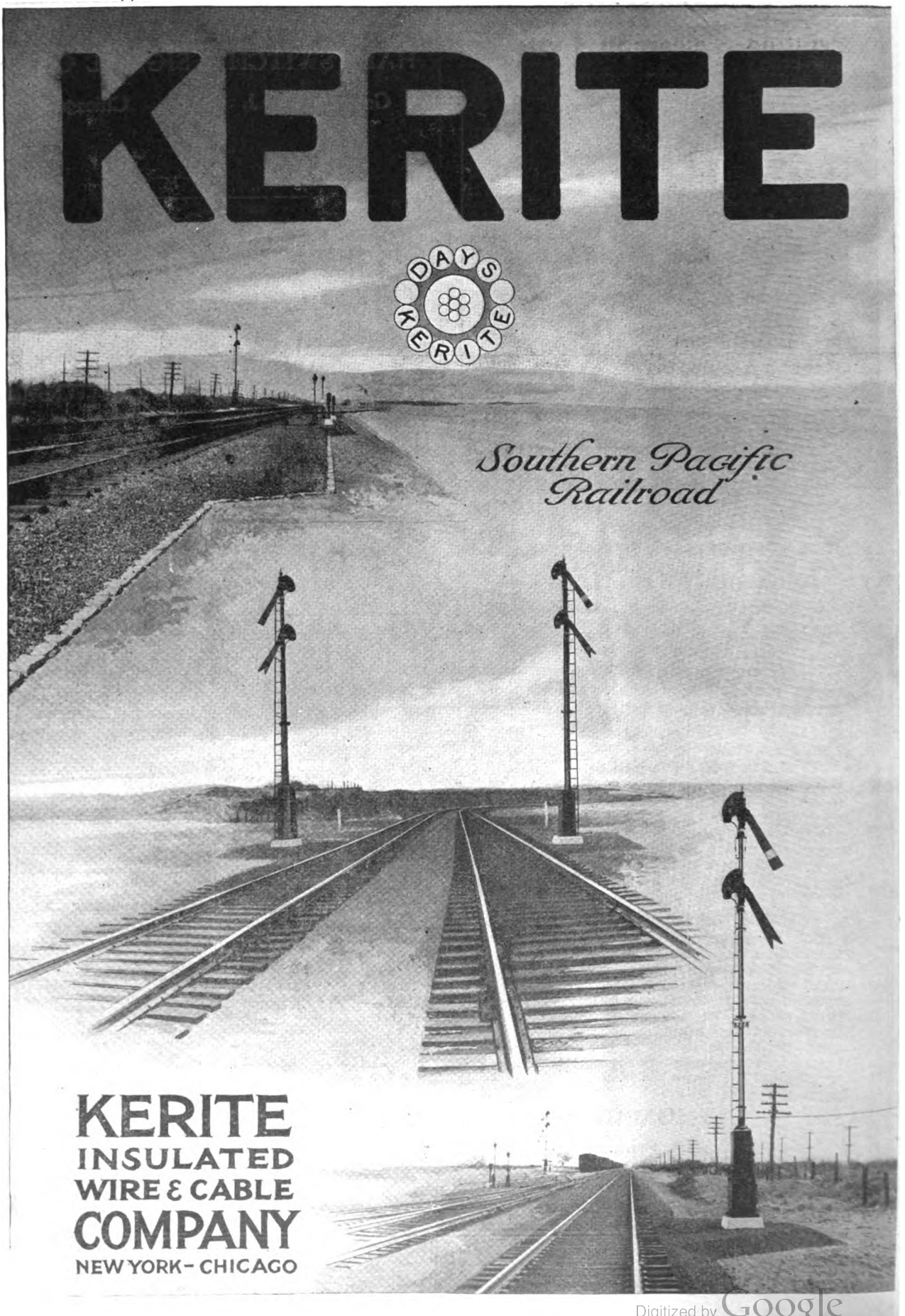

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THE RAILROAD

Telegraph and Telephone Section of the American Railway Association

The Telegraph and Telephone Section of the American Railway Association met at the Hotel Cleveland, Cleveland, Ohio, on September 21st, 22nd and 23rd. It was by far the largest and most important gathering of any of the series since the establishment of the association in 1882. The program of procedure printed in our September 16th issue was strictly adhered to.

The meeting was called to order by H. Hulatt of Montreal, chairman of the section, who introduced Mr. Metcalf, director of finances of the City of Cleveland, who welcomed the delegates, and presented Mr. Hulatt, for the benefit of the members, the Key to the City.

Letters and telegrams of regret were read from R. H. Aishton, president of the American Railway Association, J. E. Fairbanks, general secretary, W. W. Aterbury, vice-president of the Pennsylvania System, and P. W. Drew of Chicago, for over twenty-five years secretary of the association, who were unable to be present.

Mr. Hulatt then spoke on what had transpired during the year, and emphasized the importance of educational advantages to be derived and taken part in the activities of the section.

Dr. Dayton C. Miller, professor of physics of the Case School of Applied Science, Cleveland, delivered an address on "Electric Wave Motions and Allied Scientific Phenomena." The lecture was illustrated by stereopticon views and proved to be most interesting.

The report of the Committee of Direction was read and accepted.

The report of Committee No. 1—Construction and Maintenance—Outside Plant, was accepted as information, and this together with all of the other reports will be printed in the proceedings of the session.

Report of Sub-Committee A—Construction and Maintenance of Pole Lines, was accepted for submission to letter ballot for inclusion in the manual.

Report of Sub-Committee B—Wire Crossings, was adopted for submission to letter ballot for inclusion in the manual, and that the questions of rearranging certain paragraphs making minor changes in the language and inserting additional data of value be submitted to the Committee of Direction for such action as may be necessary.

The next paper was presented by O. B. Blackwell, entitled "Carrier Current Telephony and Telegraphy," by E. H. Colpitts and O. B. Blackwell. This paper is printed in full in another part of this issue. Considerable discussion following the reading of the paper, all of which brought out valuable additional information from the author.

Report of Sub-Committee D—Transpositions, was accepted as information.

Report of Committee No. 2—Construction and Maintenance—Inside Plant, was also accepted as information.

Report of Sub-Committee G—Apparatus and Materials, was accepted for discussion, which followed.

Report of Sub-Committee H—Location and Layouts, was accepted as information.

Report of Sub-Committee J—Circuits and Currents Supply, was accepted for discussion.

Report of Sub-Committee K—Insulation and Maintenance, was accepted in part. The specifications for installation and maintenance of gravity batteries was accepted for submission to letter ballot for inclusion in the manual. The remainder of the report was accepted for discussion, which followed.

Stanley Rhoads of New York presented his paper entitled "Some Phases of Railroad Telegraph and Telephone Engineering." This paper received the approval of all present, and Mr. Rhoads was congratulated on presenting so many important and interesting facts.

Report of Committee No. 3—Protection Against Electrolysis, was accepted as information.

Report of Committee No. 4—Protection Against Lightning for Electric Light and Power Circuits, and all the specifications contained therein, were adopted for submission to letter ballot for inclusion in the manual.

Report of Committee No. 5—Telegraph and Telephone Development, was accepted as information.

Report of Committee No. 6—Message Traffic, contained ten separate items, two of which were accepted for submission to letter ballot and the others were accepted as information and for discussion, which followed.

Report of Committee No. 7—Inductive Interference, was accepted for submission to letter ballot for inclusion in the manual.

Report of Committee No. 9—Future Activities and Topics, was accepted.

Report of Committee No. 10—Technical Training, was accepted for discussion. The title of the committee was changed to Education and Training of Telegraph and Telephone Employees.

Report of Committee No. 11—Telephone Transmission, was accepted for discussion, which followed at some length. The title of the committee has been changed to Telegraph and Telephone Transmission. E. C. Bowman of the American Telephone and Telegraph Company, New York, answered the questions on telephone transmission proposed by the members.

Report of Committee No. 12—Radio and Wired Wireless, was accepted as information for discussion, which followed, and the title of the committee was changed to Wire Carrier.

W. H. Hall, general superintendent, Denison, Texas, was then elected chairman of the section for the ensuing year. R. F. Finley, Cleveland, was elected first vice-chairman. I. C. Forshee, Philadelphia, second vice-chairman.

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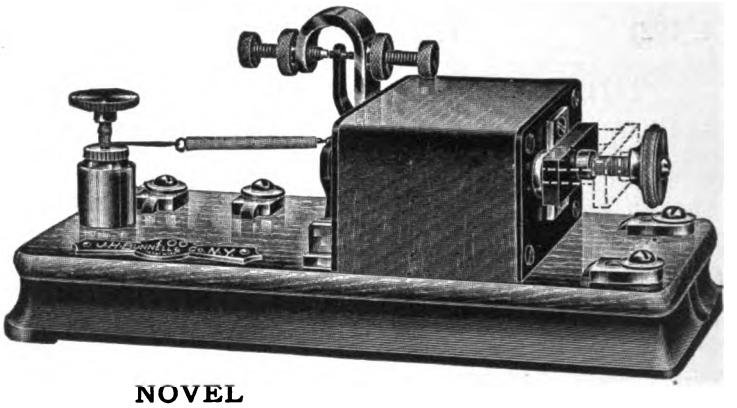
THE GHEGAN RELAY



NOVEL

A radical departure in method of **Adjusting the Magnetic Circuit** is a novel feature of the GHEGAN RELAY, in which the result is obtained by moving the yoke or back iron from contact with the cores.

SENSITIVENESS

The armature and cores are maintained in close proximity so that all lines of force pass through the armature, making it **much more sensitive** than the old method of separating the cores and armature, which permitted some lines to pass direct from one core to the other without passing through or affecting the armature.

PROTECTION

This fixed position of the magnets permits absolute protection to the wires from magnet spools to terminals as well as to the spools themselves.

SIMPLICITY

The Ghegan Relay is simplified in construction by eliminating sliding mechanism for adjusting the magnets and dispensing with the magnet adjustment post and spring.

The illustration shows all these points. The magnet spools and their connecting wires are protected by a substantial cover, the yoke is shown in closed position, in contact with the cores, the dotted lines indicate its position when fully separated from them.

The adjustment operation has not been changed.

Turning the nut to the right, or clockwise, withdraws the yoke from the cores and produces the same effect as withdrawing the cores from the armature. An ingenious arrangement prevents any sudden change at moment of separation.

In short, it is a **handsome, compact** and **practical instrument** of the very **highest grade, simple, sensitive** and **durable.**

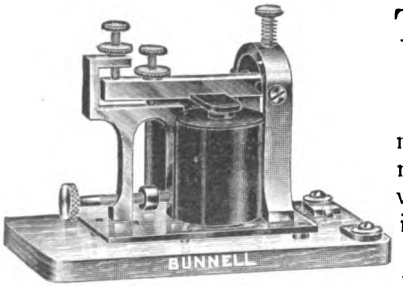
It can be furnished in the different forms of multiple windings and mountings for multiplex and repeaters, etc.

It is an improvement that will keep them "on the job" and "away from the repair shop" indefinitely.

ATTRACTIVE PRICES

The prices of the various types and windings will be found attractive and will be quoted on application.

List price of Single Relay, mounted on slate base, with iron surbase and fireproof magnet covers, wound to 150 Ohms, $9.00. Subject to usual discount.



The New Ghegan Main Line Sounder

SIMPLEX FORM

This Sounder, like the Ghegan Relay, keeps the magnet and armature in fixed positions, and varies the magnetic circuit by moving the yoke or back iron with a knurled-headed adjusting screw, which is shown in the illustration, in front of thesounding post.

The new Ghegan Main Line Sounder is simple in construction, perfect in work, and low in price.

Prices, Discount Schedule BA:

New Ghegan Main Line Sounder only, 50 Ohms	**$9.00**
New Ghegan Main Line Sounder only, 150 Ohms	**10.00**
With Key on Base, 50 Ohms	**12.00**
With Key on Base, 150 Ohms	**13.00**

J. H. BUNNELL & CO., (Incorporated) **32 Park Place, New York**

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The Committee of Direction: E. A. Chenery, St. Louis; G. D. Hood, Chicago; G. A. Cellar, Philadelphia; H. A. Shepard, New Haven; E. C. Keenan, New York, and J. H. Brennan, Springfield, Mo. Committee on Nominations: C. S. Rhoads, Indianapolis; L. S. Wells, New York; E. E. Dildine, St. Paul; Wm. Bennett, Chicago; W. E. Bell, Montreal.

The Committee on Resolutions, consisting of Messrs. Brennan of Springfield, Mo.; L. S. Wells, New York, and Connelly, Gibson, Ind., in its report thanked the American Institute of Electrical Engineers, the American Telephone and Telegraph Company, General Electric Company, Harland Engineering Company, Pacific Telephone and Telegraph Company, Page Steel and Wire Company, Radio Corporation of America, Reliable Electric Company, Western Electric Company, Western Union Telegraph Company, Westinghouse Electric and Manufacturing Company, and other interests for courtesies extended.

The new Committee of Direction held a meeting immediately after adjournment and appointed standing and special committees, and assigned work for the ensuing year to each. The personnel of the committees appointed are practically the same as last year. The Committee of Direction decided to hold the March, 1922, meeting in Richmond, Va., and the September, 1922, annual session in Colorado Springs, Colo.

Chairman H. Hulatt was ably assisted throughout the entire meeting by W. A. Fairbanks, secretary.

On the occasion of the banquet which took place on Thursday evening, September 22nd, at the Hotel Cleveland, a direct telegraph wire connected the banquet hall with Thomas A. Edison at his West Orange Laboratory, and many exchanges of greetings were made with the electrical "wizard." Mr. Edison sent the following message to the assembled members of the association:

Orange, N. J., Sept. 22nd.

Telegraph and Telephone Section,
American Railway Association:

It is with great pleasure and some pride that I am still able to send readable Morse—that I extend my kindest felicitations and congratulations to you upon the manner which you are carrying on the work begun by the Railway Telegraph Superintendents in 1882. This occasion brings back to me pleasant recollections of the days of 1865, when I was a regular and probably a better operator. I hope some of my comrades are there tonight. To all I extend my "73."

EDISON.

Convention Hall, Cleveland, Ohio.
September 22, 1921.

To Thomas A. Edison,
Orange, N. J.

We appreciate the honor of receiving your telegraphic greeting sent by you in old reliable Morse. Your sending is still excellent. Many of your old telegraph friends, of whom I am proud to be one, are here and join in all good wishes, with the hope that you will continue for many years to contribute achievements by which civilization has benefitted so richly. Some of our younger members are greatly relieved now that your message is in—they were afraid you might send your latest questionnaire. Do you care to ask us something easy, "73"?

CHAS. SELDEN.

Mr. Edison, accepting the hint of Mr. Selden, then propounded the following questions to the amusement of the assembled delegates:

No. 1—On what roads was the telegraph first used for train dispatching, and when?

No. 2—Name the operator who could receive the car numbers of fifteen cars in one message, and could then sit down and write them out. He died about eight years ago.

No. 3—Name four presidents of railways who started as telegraph operators.

No. 4—Why do Erie railway telegraph operators use eight dots for the letter P?

No. 5—What is the difference between a night operator and a drowned man?

No. 6—What telegraph superintendent can tell the most funny stories?

No. 7—Name the telegraph superintendent who came to New York and after a heavy dinner told the taxi chauffeur to drive over the Wheatstone Bridge.

No. 8—Who is Charles Selden?

1. The Erie Railroad.
2. David McCargo.
3. A. H. Smith, New York Central; John J. Bernett, Nickle Plate; A. J. Earling, Chicago, Milwaukee & St. Paul; George W. Stevens, Chesapeake & Ohio; Carl Gray, Union Pacific, and many others.
4. Because Erie is all dots.
5. Can't raise either.
6. E. A. Chenery, Geo. A. Cellar, W. F: Williams, L. B. Foley, E. C. Keenan, and a lot of other chestnut venders.
7. W. H. Hall of the "Katy," Denison, Texas.
8. Party is unknown; send better address.

How many of the boys are there with you?

One hundred and seventy-five boys representing railways, and one hundred ladies; count 'em as they vote.

Holy gee! I did not think you had grown so big.

Yes, and still going strong. There are two hundred and seventy-five listening to you, and every one here wishes you were with us. I'm coming over to see you soon.

Do so. Bring some new ones.

Good Night.

Other entertaining features were numerous, among them being an informal reception at the Hotel Cleveland on Tuesday evening, at which there was community singing and dancing and various stunts for the amusement of those present.

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The active members present were:
Akron, Ohio—J. W. Murphy.
Ashtabula, Ohio—C. E. Henry.
Albany, N. Y.—L. G. Conklin.
Baltimore, Md.—E. W. Day, C. A. Plumly, B. F. Thompson, J. H. Broadbent, Chas. Selden.
Brewster, Ohio—P. Vliet, P. G. Vliet.
Boston, Mass.—A. R. Belmont, R. R. Stackpole.
Battle Creek, Mich.—J. B. MacGregor.
Chattanooga, Tenn.—J. F. Hale.
Cleveland, Ohio—A. Behner, W. L. Blair, J. C. Deck, R. F. Finley, T. S. Christy, G. J. MacKensie, W. Lovejoy, F. W. Wiegand, H. Braschintz, L. D. Falkenstein, T. H. Shampough, M. E. Tuttle.
Charlotte, N. C.—R. L. Atwell, J. A. Jones, J. W. Sutton.
Canton, Ohio—J. V. Lowery.
Columbus, Ohio—B. J. Schwendt, G. T. Stanton.
Cincinnati, Ohio—E. T. Ambach, W. S. Melton, E. M. Pence.
Chicago—A. W. Douglas, Edw. G. Hall, C. W. Hixson, E. A. Bull, G. D. Hood, F. H. Kahl, O. L. McCreary, E. A. Patterson, John Miller, F. T. Wilbur, G. R. Stewart, E. A. Burkett, W. E. Staley.
Denison, Texas—W. H. Hall, R. A. Hendrie, H. J. Johnson.
Denver, Colo.—J. W. Brunton.
Decatur, Ill.—J. P. Church.
Detroit, Mich.—Chas. E. Baxter, W. A. Jackson, J. J. Ross, G. W. Trout, A. A. Dawson.
El Paso, Texas—M. O. Scobee.
Fort Wayne, Ind.—W. P. Hallenstein, H. D. Reynolds.
Gibson, Ind.—W. L. Connelly.
Grand Rapids, Mich.—F. D. Newman.
Greenville, Pa.—L. J. Henderson, F. W. Smith.
Galveston, Texas—J. Matthews.
Houston, Texas—Percy Hewett.
Hamilton, Ont.—R. L. Latham.
Harrisburg, Pa.—J. H. Ditch, B. F. Dickinson.
Hagerstown, Md.—E. E. Bradley.
Indianapolis, Ind.—K. A. Hinton, J. L. Niesse, C. S. Rhoads, E. A. Bates, R. D. Merideth. E. M. Brownlee, W. F. Filson,
Jersey City—R. H. Corson, J. P. Kreiter, H. N. Stump.
Joliet, Ill.—E. L. Callahan.
Lafayette, Ind.—E. G. Stradling.
Louisville, Ky.—F. R. Grunwald, R. R. Hobbs.
Milwaukee, Wis.—A. C. Adams.
Middletown, N. Y.—G. H. Caley.
Memphis, Tenn.—J. E. Drewry, B. Weeks, D. C. Walker.
Montreal, Que.—W. E. Bell, H. Hulatt, Thos. Rodger.
Macon, Ga.—R. M. Hitchcock.
Norfolk, Va.—W. F. Williams.
New Haven, Conn.—Chas. S. Down, H. A. Shepard.
New Castle, Pa.—Percy Lavarack.
New York—W. A. Fairbanks, L. B. Foley, J. J. Graf, E. C. Keenan, Stanley Rhoads, A. Y. Tomlinson, A. B. Taylor, L. S. Wells, S. L. Van Akin, A. H. Grathmann.
Omaha, Neb.—P. F. Frenzer, W. P. McFarlane.
Oil City, Pa.—E. G. Baumann.
Oskaloosa, Iowa—J. P. Houston.
Pittsburgh, Pa.—G. A. Dornberg, L. A. Lee, J. S. Genschimer, M. R. Greenamyer, W. M. Post, H. C. Stanton, K. C. White, L. Behner, A. E. Rousch.
Parsons, Kan.—D. C. Hudspeth.
Philadelphia, Pa.—G. A. Cellar, I. C. Forshee, P. A. Rainey, G. J. Smith, J. D. Jones, Wm. S. Logan, J. R. Theiss.
Richmond, Va.—J. A. Gleason, T. R. Gooch, H. C. Peterson, C. M. Marker.
Roanoke, Va.—G. W. Jett.
Rutland, Vt.—W. O. Cutler.
Reading, Pa.—E. P. Laird, L. D. Shearer.
South Bethlehem, Pa.—J. F. Caskey.
St. Louis, Mo.—G. E. Bradley, J. C. Browne, C. C. Davis, E. A. Chenery, W. Rogers, W. D. Shermer, C. E. Wynne.
Stevens Point, Wis.—G. H. Mayer.
St. Paul, Minn.—H. C. James, Jr., J. C. Rankine, R. C. Thayer, E. E. Dildine.
Springfield, Mo.—J. H. Brennan, S. B. Musgrave, C. H. Williamson.
Syracuse, N. Y.—C. L. Steinhart.
Toledo, Ohio.—C. J. Hickox, Wm. Fork.
Terre Haute, Ind.—F. H. Van Etten.
Toronto, Ont.—C. E. Davies, E. Kenward.
San Francisco.—E. Entelman.
Wilmington, N. C.—W. P. Cline.
Williamsport, Pa.—D. E. Spangler.
Fifty of the members were accompanied by their wives or other members of their families.

Exhibitors and Associate Members

J. H. Bunnell and Company, New York, demonstrated their new Ghegan relay and alternating current relay. The Ghegan relay attracted a great deal of attention. The company was represented by the president, John J. Ghegan, and its treasurer, Charles E. Graham.

Kerite Insulated Wire and Cable Company: Edward L. Adams, J. A. Hamilton, P. W. Miller, and J. W. Young.

Western Union Telegraph Company: Martin H. Clapp, Douglas P. Dickie, H. W. Drake, Paul J. Howe, and G. E. Sharp.

Western Electric Company: E. V. Adams, A. M. Collins, and George Hull Porter.

National Carbon Company: W. H. Arkenburgh, A. E. Pratt, and J. M. Spangler.

Central Electric Company: Ray N. Baker.

New York Telephone Company: F. W. Bayles and W. E. Bell.

Cook Electric Company: J. C. Bogle and D. C. McKee.

American Telephone and Telegraph Company: E. C. Bowman, Francis P. Brennan, Charles K. Flanders, Roger F. Hosford, B. A. Kaiser, and Kenneth L. Wilkinson.

Mountain States Telephone and Telegraph Company: F. A. Cannon.

Twin Dry Cell Battery Company: F. L. Carson and Charles S. Pflasterer.

Reliable Electric Company: W. L. Cook.

Dodge's Institute of Telegraphy: G. M. Dodge.

Simmons-Boardman Publishing Company: Ralph F. Duysters and K. E. Kellenberger.

Southwestern Bell Telephone Company: A. E. Eyermann.

Illinois Bell Telephone Company: A. G. Francis.

Thomas A. Edison, Inc.: P. A. Garrity.

National Electric Specialty Company: J. T. G. Greene.

The Okonite Company: J. W. Hackett.

Bell Telephone Company of Pennsylvania: J. H. Hoffman and Thomas R. F. Peyton.

Northwestern Telegraph and Telephone Company: Leslie H. Jenks.

Kellogg Switchboard and Supply Company: Charles A. Larsson.

Bureau of Standards: Dr. M. G. Lloyd.

General Railway Signal Company: H. W. Lucia.

Railway Signal Engineer: E. A. Lundy.

Ohio Bell Telephone Company: S. C. Moule and J. D. Templeton.

Waterbury Battery Company: G. A. Nelson.

Postal Telegraph Cable Company: J. P. O'Donohue and W. L. Simpson.

Kleinschmidt Electric Company: A. H. Reiber.

General Electric Company: Ray Stearns.

Indiana Bell Telephone Company: D. H. Whitham.

Practical Lessons in Electricity, by Millikan-Crocker-Mills, price $2.00 per copy. The book measure 5½ inches wide by 8½ inches in length. It is a simple presentation of fundamental electrical principles and their application to direct and alternating current problems.—Advertisement.

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All America Cables

RAPID progress is being made in laying the cable about four hundred miles in length connecting New Orleans, La., with Vera Cruz, Mexico, and it is thought that within two months New Orleans will have direct cable connections with the All America Cable system.

J. B. SMITH, staff superintendent, returned to New York on August 31st, after a trip over the company's system as head of President Harding's commission.

C. E. CUMMINGS, superintendent of the Mexican Division, arrived in New York on September 19th on a visit.

WILLIAM WISEMAN, manager at Salina Cruz, Mexico, is in New York on furlough.

J. O. WISEMAN, formerly manager at Santa Elena, Equador, is in New York on vacation. On his return to duty he is to be manager at Fisherman's Point, Cuba.

E. O. German, manager, La Libertad, Salvador, and O. Hecksher, division electrician of the East Coast, are in New York on company business.

THE following appointments of managers have been made: W. J. Butterfield, at Cartagena; Morley Hurst, San Juan del Sur, Nicaragua, and F. H. P. Schrils, Buenaventura, Colombia.

CONSIDERABLE pogress has been made in the erection of the company's new eight-story building in the rear of the present structure, at 89 Broad Street, New York. The foundation was completed in August and the girder work is now almost finished. This additional building, when completed, will double the space at present occupied by the headquarters of the company. The building will be an exact duplicate of the 89 Broad Street structure.

The Cable

THE Commercial Pacific Cable Company's schooner *Flaurence Ward* was rammed by the steamer *Wilmington* manoeuvring in the harbor of Honolulu on August 14th, and sustained damage estimated to the extent of ten to fifteen thousand dollars. The *Flaurence Ward* sails between Honolulu and Midway Island. She is the supply ship for the cable station on the island. Efforts to complete repairs in time for her scheduled sailing in the middle of September were successful.

M. G. TEMPLE, chief electrician of the cable steamer *Henry Holmes*, died in Kingston, Jamaica, September 13th, following an operation for abscess in the ear. Mr. Temple had been electrician on the *Henry Holmes* for many years, and at one time was assistant to Maynard Dodd, chief electrician of the cable steamer *Minia*.

EDWARD SUENSON, founder of the Great Northern Telegraph Company, one of the largest cable systems in the world, died at Copenhagen, Denmark, on September 21st.

A Good Book For a Small Sum

Modern Land and Submarine Telegraphy, by Macomber, price 75 cents per copy, 6 inches by 8½ inches in length, fully illustrated. It is a ninety-page book and is devoted to a brief up-to-date treatise on the electric telegraph, including the development of modern methods and equipment.—**Advertisement.**

Radio Corporation of America

PRESIDENT E. J. NALLY of New York has returned to Paris from Berlin.

TRAFFIC MANAGER W. A. WINTERBOTTON was in Washington recently in connection with the Disarmament Conference.

COLONEL C. H. NANCE of the Pan-American Wireless Telegraph and Telephone Company is en route to New York from Buenos Aires on a business trip.

G. J. ESHLEMANN, engineer, has returned to New York from a six months' stay in Hawaii, bringing with him a bride.

G. L. USFELMAN, engineer in charge at Rocky Point, L. I., has returned from his vacation with a bride.

MR. OLSON, attorney for the Radio Corporation at Honolulu, was recently killed in an automobile accident there.

THE Radio Corporation of America is stringing two additional copper wires between Honolulu and Kahuku, making six in all.

THE engineering staff has arrived at Rocky Point, L. I., and final tests are being made in preparation for placing the new station in service.

THE Radio Corporation had an extensive exhibit at the recent Electrical Exhibition in New York.

MESSRS. Sciavi, Brickford and Taylor, late of the Belmar, N. J., station, have been appointed office electricians at the Central Radio office, 64 Broad Street, New York.

L. A. BRIGGS, late assistant superintendent, Belmar, N. J., station, has been appointed assistant superintendent, Central Radio office, 64 Broad Street, New York.

Sweden Abandons Radio Project

The Swedish Government has abandoned its plan to erect a high-powered wireless station to communicate with America. The appropriation which Parliament had authorized for the construction of the station has been withdrawn.

The reason given is that Sweden was unable to make a satisfactory traffic agreement with the Radio Corporation of America.

"Code at a Glance"

The National Association of Electrical Contractors and Dealers has just issued "The Code at a Glance," price $1.00 per copy. Wherever any sort of an electrical inspection service exists, whether State, municipal or underwriters, the installation of electric wiring and appliances for light, heat or power, and quite frequently for signalling, must be performed in the manner specified in this code. It is the authority for all contractor's work. The book measures seven inches in length by three inches in width and contains ninety-six pages. The flexible cover makes the work convenient to carry in the pocket. Copies may be obtained at the price named by addressing TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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PERSONAL

J. McMILLAN, general manager, Canadian Pacific Railway Company's Telegraphs, Montreal, was a New York business visitor on September 15th.

F. C. HACKETT, president of the Toledo Terminal Warehouse Company, Toledo, Ohio, accompanied by his wife, were recent New York visitors, making the trip to the metropolis by automobile. Mr. Hackett was formerly manager of the Western Union Telegraph Company's office in Pittsburgh, Cleveland and other cities, and is well known in telegraph circles. He called on many of his old friends when in New York.

POSTAL TELEGRAPH-CABLE COMPANY

E. KIMMEY, superintendent, Boston, was a recent executive office visitor.

C. A. COMSTOCK, assistant to the general manager, has returned from a motoring trip through New York State and Massachusetts.

E. P. TULLY, assistant to the general manager, is away on a brief vacation.

J. P. O'Donohue, assistant chief engineer, is absent on a trip of inspection.

THE company has recently opened an up-to-date office in the new Barrett Building, New York City.

New York City

JOSEPH SHEFFREY has been transferred from the management of the 49 West 30th Street office to the 42nd Street and Broadway office.

MICHAEL PERTKA has been promoted from the managership of Long Island City to succeed Joe Sheffrey at the 49 West 30th Street office.

HUGO MORITZ has been promoted from the management of the Pennsylvania Terminal branch, to succeed Mr. Pertka at Long Island City.

A. ALBERTS has been promoted from the position of day operator at the Pennsylvania Station to the managership of the same office, in place of Mr. Moritz.

JAMES DUGGAN, manager of the 173 East 125th Street office, has been home for some time on account of illness.

MISS M. E. SCULLY is temporarily relieving Manager Hozier of the Wool Exchange office, who is on sick leave.

CHARLES MULLER has been appointed chief operator of the 26 Cedar Street office.

MISS HARRIET DORITHIE of the telephone department recently resigned to be married.

OUR hats off to "Si" Ostrom of the New York Cotton Exchange branch. During the recent break in the cotton market "Si" smashed all previous records for handling heavy traffic.

MANAGER OSTRANDER of the 1504 Third Avenue office is again back at his duties, after a siege of illness.

MRS. B. C. LAMPLOUGH of the New York main office, who worked the Elmira local for many years, died of pneumonia on September 19th.

Managers Appointed

L. W. Pollert, Stithton, Ky.; B. F. Hamel, Natchez, Miss.; G. F. Townsend, Henderson, N. C.; E. B. Hartpence, Atchison, Kan.; L. E. Shull, Shawnee, Okla.; Clara Thompson, Bowling Green, Ky.; R. W. Levanway, Troy, N. Y.; B. McClure, Piqua, Ohio; R. E. B. Allen, Thomasville, Ala.; E. A. Johnstone, Pocatello, Idaho; W. E. Erickson, Rochester, Minn.; F. M. Wolf, Council Bluffs, Ia.; W. A. Salmon, Ottawa, Ill.; Mrs. G. W. Wright, Orangeburg, S. C.; Earnest Weathers, Hendersonville, N. C., and J. L. Tucker, Greensboro, Ala.

Fall Dinner of the Magnetic Club

The date of the fall dinner of the Magnetic Club has been fixed for Saturday evening, October 29th. The dinner will be held in the north ballroom of the Hotel Astor. Considerable interest is being manifested in the occasion, and the committees are working with a view of making the dinner the most enjoyable in the history of the club.

At this dinner the winners of Class A banners in the Postal Telegraph-Cable Company's contest will be the guests of that company.

Philadelphia

THE office of the Postal Telegraph-Cable Company recently installed in the Ritz-Carlton Hotel, Atlantic City, N. J., was taxed to its utmost during the recent visit of President Harding to that hostelry. Mrs. Florence E. Albright, manager, was ably assisted by two operators, who disposed of considerable newspaper matter.

JAMES H. WILSON, manager, Postal Telegraph Cable Company, has returned to his desk from a vacation spent with Mrs. Wilson at Atlantic City. He was joined on the Boardwalk by A. G. Strickland of the American Telephone and Telegraph Company and Frank R. Webb, chief operator of the Western Union Telegraph Company.

CHARLES C. ADAMS, former vice-president of the Postal Telegraph-Cable Company, was seen strolling along the Boardwalk of Atlantic City last week, being a guest of the new Ritz-Carlton. Notwithstanding the fact that Mr. Adams is now a full-fledged banker, he still takes considerable interest in telegraph affairs.

EARL W. MILLER, chief operator, Postal Telegraph-Cable Company, is enjoying a much deserved vacation with his family.

OUR readers should remember that when they have occasion to communicate with advertisers, it is important that they mention TELEGRAPH AND TELEPHONE AGE. The advertisers appreciate this courtesy.

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WESTERN UNION TELEGRAPH CO.

J. C. WILLEVER, vice-president in charge of commercial, is enjoying a three weeks' rest on his farm in Warren County, N. J.

THE Western Union Telegraph Company reports July operating revenue at $8,349,685, a decrease of $1,930,162; operating income, $785,939, a decrease of $559,524; for seven months, $60,230,835, a decrease of $9,270,029; operating income, $7,017,082, a decrease of $3,136,722.

The Western Union Insurance and Benefit Department

According to the report the Western Union Telegraph Company's life and health insurance department, $920,028.54 was disbursed by that branch of the company's welfare agency during 1920, an increase of $140,000 over the previous year's disbursements.

The telegraph company maintains at its own expense an insurance bureau for all employees, and the tabulation of amounts paid out during last year follows:

Illness, 3,757 cases, expenditure $414,749.00.
Pensions, 588 employees.
Life insurance, 109 cases, $109,000.
Salaries and medical expenses of injured employees, expenditure, $116,000.

These payments are made by the Western Union from a fund of $1,000,000 which is replaced at the end of each year. Steady increases in the number of employees has resulted in the consumption of nearly the entire fund in 1920. There are no deductions or collections from the employees to maintain the fund.

Eastern Division

T. B. CLARK of General Manager T. W. Carroll's office is on vacation.

MRS. F. E. DAWSON of General Manager T. W. Carroll's staff has been transferred to President Carlton's office.

J. M. SCANNELL, manager at Gloversville, N. Y., has been transferred to Troy, relieving G. H. Dawson, acting manager, who returns to Cortland.

G. C. BOYD, formerly manager at Fleischmanns, N. Y., assumes charge at Gloversville, vice J. M. Scannell, transferred.

H. J. ROBILLARD, manager at Dunkirk, N. Y., has been promoted to the position of assistant manager at Albany, N. Y.

MISS A. D. NEILSON, formerly with Superintendent F. R. Veale, New York, is now at Dunkirk, N. Y., acting manager.

MISS C. E. HULL, who was assigned to the Plattsburg, N. Y., office for the summer, has again assumed the managership at Hoosick Falls, N. Y.

THE company has recently moved into new and up-to-date offices at Schenectady and Watertown, N. Y.

ARRANGEMENTS are now in progress for a new office at Elmira, N. Y.

New York Western Union

JOSEPH GSCHWIND, whose appointment as night chief operator in the main office at 24 Walker Street was recorded in the September 16th issue, was born in New York City, August 13th, 1869. His entire business career has been spent in the service of the Western Union Telegraph Company in this city, where he began as a messenger in the main office at 195 Broadway in 1884. He soon developed into an operator and was later advanced to the positions of night eastern traffic chief, night general traffic chief, assistant general wire chief and assistant chief operator. The elevation to his present position of night chief operator comes as a reward for service well performed.

James F. McGuire, night chief operator of the New York main office, who died on August 27th, and which was recorded in our September 1st issue, was a remarkable man for the courtesy and attention he was always ready to give to all seekers for information of a telegraphic character, so numerous at night, when all the other company officials were resting from their labors. The one who has to represent them all to the public is the night chief operator of the New York office. How well and satisfactorily Mr. McGuire filled this bill is evident from the expressions of regret and sorrow received from so many sources.

Among the employees of the company the sorrow at the loss of their quiet, gentlemanly and courteous chief is quite general, and justly so, for Mr. McGuire had always a kind word for the men and women of the force, which made it very pleasant to work in his department.

FREDERICK LULVES, aged fifty-five years, an old time operator at 195 Broadway, for the past several years with a brokerage house, died in Brooklyn on September 14th.

Lake Division

MISS NELLIE M. BARRY of the general manager's office, Chicago, has just returned from Fargo, N. D., where she spent her vacation with her mother.

MR. AND MRS. ABE DROELICH, branch office managers from Kansas City, were recent Chicago visitors.

THE sudden and tragic death of Marcia A. Doan in an automobile accident just outside of Indianapolis, recently, was a shock to her many friends in Chicago.

MISS EMERY, formerly with the telephone department at Chicago, has opened a coffee shop in Madison, Wis., and says her Western Union training will not come amiss in helping her win the public to a just appreciation of her service.

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The facts of all important events and improvements connected with these industries are collected by our correspondents and agents throughout the world and timely presented to its readers in a clear and concise manner. It contains articles from the field by more than a hundred of the leading expert electrical engineers; also special articles for the student and thinker—those who wish to advance in their respective lines of employment, in addition to a complete course in Technical Telegraphy, a lesson in each issue, by Louis Casper, one of the leading writers on telegraph engineering subjects in the country. This feature alone is worth the subscription price for a whole year.

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F. W. BRAINERD, for more than fifty years connected with the Time Service in the Western district and Chicago, has returned from a visit to his sisters at Malden, Mass. While he was away he celebrated his seventy-third birthday and received messages and letters from friends all over the country.

E. C. KELLAM, formerly of General Manager H. C. Worthen's office, Atlanta, Ga., has entered the Moody Institute for the regular four-year course, and outside of his school hours is connected with Superintendent Brown's office at Chicago.

F. D. BERMKE, who has been absent on sick furlough for several weeks, is still unable to take up his duties in the general manager's office.

J. H. PENDRY of the general manager's office, who has been away for several months on sick leave, is recuperating at the home of his son, in Tama, Iowa.

A FAITHFUL and loyal servant of the telegraph company was retired recently at St. Louis, when Ben Powell, janitor, was placed on the pension roll. He had been many years in the service, and was one of the old-time workers who could always be depended on.

A BRANCH office was opened on the Municipal Pier during the Pageant of Progress Exposition. It was located in the booth of the Florist Telegraph Delivery Association, which was constantly bedecked with flowers. A miniature telegraph pole line occupied part of the counter space, and the display as a whole was quite attractive. A Western Union wire was utilized in the formal opening of the Pageant by Vice-President Coolidge, who touched a button in Boston that set to ringing numerous fire gongs, which were distributed about the pier by the City Fire Department.. Secretary of Labor J. J. Davis, representing President Harding, sent the first message from the Chicago pier office immediately after the opening.

THE wife of District Commercial Agent B. B. Forbes died on August 15th after a severe illness.

THE mother of Robert Whitelaw, chief clerk of the credit department, died the latter part of August.

—o—

Changes in Managers

Middletown, Ohio, F. H. Smith, vice W. E. Baxley; Bellefontaine, Ohio, E. A. Krems, vice B. P. Lindsay, and Bryan, Ohio, V. M. Edwards, vice R. G. Walker.

—o—

A PROMINENT ground floor location is being fitted up at Sidney, Ohio, and is expected to be ready for occupancy shortly, Sidney being one of the very few cities in this district where a second floor location has been maintained.

SUPERINTENDENT A. A. Montgomery, Cincinnati, has returned from his vacation, which was spent in and around Denver, Colo.

Managers Training Office, Niles, Michigan

During August, 1921, appointments of managers from the Managers Training Office were made as follows:

J. G. Morris, Highland, Ill.; Miss Marvel Gaffney, Geneva, Ill.; J. G. Hajek, Monroe, Wis.; L. D. Edick, Whiting, Ind., and E. J. Wallace, Carthage, Ill.

Student Manager H. J. Duenisch was transferred to the Niles, Mich., office as operator on August 17th, relieving former Operator Arthur Bohnke, who was transferred to Decatur, Ind.

Student Manager J. A. Gallagher returned to his home in Wheeling, W. Va., August 25th, to recuperate from a severe attack of la grippe. Mr. Gallagher is a brother of Chief Operator Gallagher of the Wheeling office.

—o—

Vacuum Tubes a Live Subject

The subject of vacuum tubes is certainly a live one in these days. Inquiries for information on this subject come from all parts of the world. There are two books on the market devoted exclusively to vacuum tubes and it will be well for students and others to have copies of one or both of these valuable works.

Vacuum Tubes in Wireless Communication, by Elmer E. Bucher, price $2.25 per copy, is an elementary text book for students, operators, experimenters and engineers. It tells in understandable language the fundamental operating principle of the vacuum tube. It shows over one hundred different circuits for the practical use of the vacuum tubes as detector, radio or audio frequency amplifier, regenerative receiver, beat receiver and generator of radio frequency currents. More than one hundred diagrams reveal, step by step, in simple and direct form, the uses of the vacuum tube.

Thermionic Vacuum Tube, by Dr. H. J. Van Der Bijl, price $5.00 per copy.

The rapidly extending use of the vacuum tube as a receptor of radio waves; generator of radio oscillations; telephone repeater; alternating current rectifier, and for other purposes, has made the instrument one of the most widely discussed inventions of recent times.

Dr. Van Der Bijl, in his book, gives a thorough treatment of the entire subject of thermionics as related to vacuum tube phenomena.

The book has 282 pages and 232 illustrations.

Copies of these books or any others may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.

—o—

THIS is the way a telegram read: "Mary cannot leave for Detroit tonight. She got wet in the a. m. and had a chill in the p. m."—Signed, Mother.

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Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps

The Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps will hold their joint annual reunion at the Hotel Jefferson, Richmond, Va., on October 18th, 19th and 20th. The president of the Association is General Jo Lane Stern, Adjutant General of the State of Virginia, Richmond, and Thomas E. Fleming, 195 Broadway, New York, is secretary and treasurer.

Those who have not already acknowledged, on the postal cards enclosed in their invitations, that they would be present at Richmond, are requested by General Stern to write him their intentions as soon as possible. This information will be helpful to the local committees in carrying out their program of preparation.

Franklin J. Scherrer, Room 1929, 30 Church Street, New York, has charge of the special car that will convey the delegates from New York to Richmond. The train will leave the Pennsylvania Station, Seventh Avenue and Thirty-third Street, New York, on Monday, October 17th, at 8.45 p. m., arriving at Richmond Tuesday 7.10 a. m. Those who contemplate taking advantage of this special car should communicate with Mr. Scherrer not later than October 10th as to the space required in the sleeping car, as the list for this special car will be positively closed on that day.

The railroad fare from New York to Richmond is $13.33. A lower berth on the Pullman car is $4.05, and an upper berth $3.24. Remittance should be made with the request for the space required. We are advised that an elaborate program of entertainment is being arranged, including a grand ball, trips by boat and rail, and, of course, a gala banquet. Historical Richmond with its battlefields and many places of interest and many well-known landmarks is well worth a visit.

Telephone Pioneers of America

The Telephone Pioneers of America will meet in annual convention at St. Louis, Mo., on October 24th and 25th, and a large attendance is expected to be present. A personally conducted special train over the New York Central Lines will convey the delegates from New York to St. Louis.

It is proposed to revise the constitution and by-laws, which will provide for the expansion and enlargement of the plan and scope of the association; also, for the establishment of chapters and other changes in the methods of governing and operating the organization.

Institute of Radio Engineers

At a meeting of the Institute of Radio Engineers held recently in New York City, a paper on "A Visual and Photographic Device for Recording Radio Signals" was presented by Charles A. Hoxie, of the General Electric Company.

Ohio Phone Companies Unite

The Ohio Bell Telephone Company and the Ohio State Telephone Company were granted authority on September 19th to consolidate by the Interstate Commerce Commission, which said that the "evidence is undisputed that the benefits to the public growing out of the proposed consolidation will be substantial."

By the terms of the agreement the consolidated company, to be known as the Ohio Bell Telephone Company, is to issue capital stock to the amount of $53,225,646.

A MESSENGER was at the depot at a little country town waiting to deliver a telegram addressed to a minister on the incoming train. Sizing up the few who alighted, he finally approached one man and said: "Excuse me, sir, are you a minister?" The man turned to him and in a mournful voice replied: "No, sonny, it's indigestion that makes me look like one."

Patrons of a Boston restaurant noticed tacked on the wall a sheet of paper on which was printed in bold characters:

"The umbrella in the stand below belongs to the champion heavyweight fighter of the world. He is coming right back."

Five minutes later umbrella and paper had disappeared. In their place was another notice:

"Umbrella is now in possession of the champion Marathan runner of the world. He is not coming back."

The Baudot Printing Telegraph System

The issue of a second edition of the "Baudot Printing Telegraph System," by H. W. Pendry, is fully justified by the extension of the use of that system in the United States and in Europe, the improvements made in the apparatus, and the general adoption of the first edition as a class manual.

The descriptions and diagrams of somewhat intricate instruments and connections are so clear that it is possible to obtain a good knowledge of the system from the book alone, without the necessity of seeing and using the instruments before the information in the book can be said to have been usefully assimilated.

Of the new matter introduced, the most notable is that treating of the Murray phonic motor and the Gulstad Relay. The chapters on Duplex Baudot and Baudot repeaters has been enlarged. The number of illustrations and diagrams has been increased from 72 to 94. The price of the book is $2.50 per copy, and orders should be addressed to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

F. H. CAMPBELL, aged eighty years, an old time operator, formerly employed at Nashville, Tenn., died at Allenville, Ky., on September 1st.

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No. 20 NEW YORK, OCTOBER 16, 1921 Thirty-ninth Year

CONTENTS

The Reverse Battery Repeater. By Harry E. Hershey of the Automatic Electric Company, Chicago. (Continued from page 437, October 1st issue) 462
Wireless Telephony. By Lt.-Col. C. G. Crawley, R.M.A. 463
Origin and Development of Radio Service in America. (Concluded from page 441, October 1st issue) 464
Sunspots and Magnetic Storms. By Arthur E. Cottrell 465
Wireless Station for Bowman Hotels 466
Telegraph History in 1853 467
Daniel S. Robeson, Line Constructor. Longitudes on the Baltimore and Ohio Railroad. By David Homer Bates 468
The Brazilian Telegraphs 469
Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps. Telegraph and Telephone Life Insurance Association 470
Observations by J. McMillan While Abroad. Marconi Wireless Telegraph Company of Canada. Navy Radio with Japan 471
Student's Course in Technical Telegraphy. By Louis Casper. Lesson 37 472
Seutter's Radio Score Perfect. New Wireless Near Moscow 473
Editorial—Mr. Edison on the Times. Four Countries to Develop World's Radio Facilities. The American Telephone and Telegraph Aerial Cable Connecting New York and Chicago. Loyalty 474
The Railroad—Telegraph and Telephone Section of the American Railway Association. Some Phases of Railroad Telegraph and Telephone Engineering. Wm. Maver, Jr. 477
Valuable Information Instantly Available. Telephone Pioneers of America 480
Personal. Postal Telegraph-Cable Company. Cable Connecting Italy and South America 481
Western Union Telegraph Company 482
Telegraph and Telephone Committee Meets in New York. Radio Corporation of America. All America Cables. German Cable Deliveries. Associated Press Operators. Obituary 483
Daily News and Concerts by Radio Telephone. What Is a Russian Rouble Worth Now? Watered Stock Impossible 484

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The Reverse Battery Repeater

By HARRY E. HERSHEY,
Of the Automatic Electric Co., Chicago

(*Continued from Page 437, October 1st Issue*)

Referring to Fig. 29 we find the familiar line relay L and the release relay R. The reverse battery relay A is a 1,300 ohm relay, and operates to reverse the polarity of the calling line. The condenser cut-off relay D is a slow acting relay of 325 ohms resistance. The electro polarized relay C has an upper winding of 1,900 ohms and a lower winding of 60 ohms resistance. The impedance coil B is 500 ohms in resistance.

Let us assume that a connection has been extended to this repeater. The line relay L will energize and close the circuit of the release relay R, which in turn will energize and place ground on the release trunk. Upon the energization of relay L a circuit may be traced from ground, through the lower winding of relay L of the selector at the distant office, lower winding of relay C, impedance coil B, make springs relay L, upper winding of the line relay L of the selector at the distant office, to negative battery. The line relay of the selector at the distant office will energize over this circuit and stand in readiness to receive the impulses which will be sent it by the repeater. When the release relay energized a circuit was closed from the ground, make springs relay R, upper winding of relay C, to negative battery. The current flowing in the two windings of relay C will at this time oppose each other, and as a result the relay will not operate. It is furthermore to be understood that the upper winding of relay C is not strong enough to operate the relay when it alone is energized.

When the subscriber dials the next figure in the number, a 6 for example, the line relay L will momentarily release its armature six times. Each time the relay L de-energizes, a circuit is closed from ground, break springs relay L, make springs relay R, condenser cut off relay D, to negative battery. The relay D will energize over this circuit, and, since it is a slow acting relay, will maintain its armature in an operated position so long as the line relay is responding to the dial impulses. When relay D energizes the talking condensers will be removed from the trunk, and at the same time the lower winding of relay C, and the impedance coil B, will be short circuited.

Each time the line relay L de-energizes it will open the circuit of the line relay L of the distant selector. In this way the dial impulses are repeated over the trunk to the switches in the distant exchange, which will respond to the repeated impulses and complete the connection in the same manner as though the impulses had come direct from a dial.

When the called party answers the connector will reverse the battery on the trunk, this will cause the upper and lower windings of relay C to assist each other. As a result relay C will energize and close the circuit of the reverse battery relay A. Relay A will energize and cause a reversal of polarity on the calling line.

When the conversation is completed the restoration of the receiver to the switch hook at the calling sub-station will cause the circuit of line relay L to be opened. When the line relay L de-energizes it

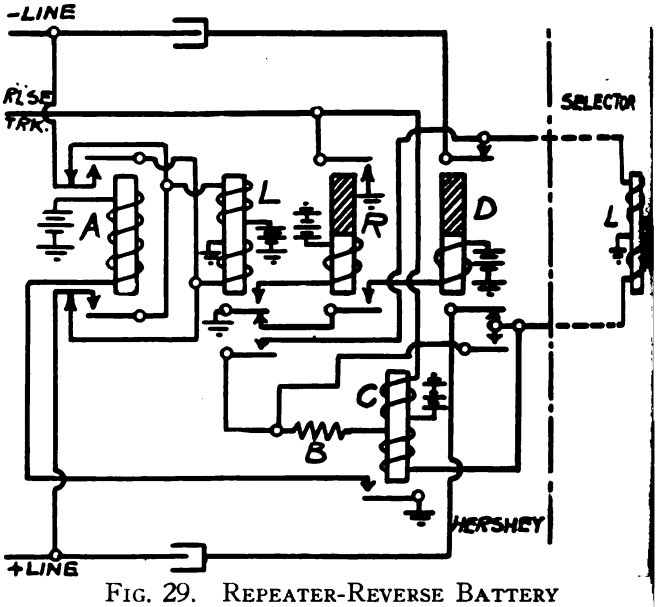

FIG. 29. REPEATER-REVERSE BATTERY

opens the circuit to the connector in the distant office, and the release of the apparatus in that office follows immediately. The de-energization of relay L also opens the circuit of the release relay R, which, upon de-energizing, will remove the ground from the release trunk, following which the apparatus in the local office will immediately release.

QUESTIONS

A. What would result if the condenser cut-off relay failed to clear the trunk from the condensers?

B. If the trunk were reversed could a connection be extended through the repeater shown in Fig. 29?

C. Why could not the high impedance be left across the trunk at all times?

(*To be continued*)

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York. —Advertisement.

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Wireless Telephony

By Lt.-Col. C. G. Crawley, R.M.A.

In communicating by speech in the ordinary way, energy is transferred from the speaker to the listener in the form of air waves, these waves being produced by oscillations, to and fro, of the little particles in the air. These air oscillations are set up by the voice, and are received as air oscillations in the ear, where they set the drum in vibration, so producing the sensation of sound. In line telephony the air oscillations set up by the voice actuate an instrument, the microphone transmitter, which varies the strength of the electric current flowing along the line. These variations of the current work the receiving instrument, the telephone receiver, in such a way as to produce sound waves precisely similar to those which caused the variations at the sending end. In this way the energy of the air oscillations at the transmitter is transformed into the energy of current variations in the line, and re-transformed into sound at the receiver.

In the case of wireless telephony the procedure is very similar, except that the variations of a current flowing in a system of elevated wires, called the aerial or antenna, produce variations in the continuous stream of ether waves which this current causes to be radiated in all directions, and these ether waves cause a current with similar variations to flow in any other aerial which they meet.

In ordinary speech, therefore, air waves proceed direct from the sender to the receiver; in line telegraphy they vary an electric current which produces similar air waves at the receiver; and in wireless telephony they vary an electric current which produces variations in ether waves, which, in their turn, produce air waves at the receiver.

The medium by which energy is transferred in line telephony is the wire connecting the sender to the receiver, whereas in wireless telephony the medium is the ether which connects all senders to all receivers, and it is this fact which constitutes the great advantage of the latter, viz., all senders are at no cost automatically connected to all receivers. It must not be thought, however, that such a great advantage can be attained without dragging some serious disadvantages in its train. The use of the same medium, for instance, leads naturally to difficulties in selectivity, that is, one communication being interfered with by others, or by electrical disturbances in the ether itself, such as those caused by lightning. Interference between various communications is overcome to a great extent by arranging that different lengths of waves in the ether are used for different communications, the apparatus for one communication being adjusted to respond much better to ether waves of one special length than to those of any other length. When the apparatus at each end are thus arranged for transmitting and receiving respectively ether waves of the same length, they are said to be in tune with one another, and the greater the number of different communications required, the greater are the number of wave lengths that must be arranged for. Now it is just this requirement that makes an extensive network of different communications very difficult and often impracticable, because for good working over approximately the same range, the various wave lengths which can be economically used are strictly limited. Wireless telegraphy makes use also of ether waves so that the available field for selection is still further reduced. With line telephony, on the other hand, there is, of course, no such limitation, separate channels being used for each of the various communications.

The other trouble mentioned, that of interference from electrical disturbances in the ether, is also very serious, just as it is in the case of wireless telegraphy. These disturbances, or "atmospherics," are very troublesome indeed in tropical climates, and even in temperate climates they produce much interference in the summer months. For "broadcasting" a message, that is, sending a message out to all stations within range which wish to receive it, the difficulty as regards wave lengths is, of course, reduced, and many interesting demonstrations on these lines have recently been given in this country. On one occasion last year Dame Melba sang into a transmitter at the Marconi Company's station in Chelmsford, and the songs were heard clearly at many wireless receiving stations on land and sea up to distances of several hundreds of miles. The Press Association carried out tests last year, under the supervision of the Post Office, to see how far such a broadcasting system could be utilized for news messages, but they considered that the results obtained did not justify, at present, the adoption of wireless telephony for this purpose.

At first sight, it would seem that wireless telephony has several great advantages over wireless telegraphy, but these are more apparent than real. Telephony does not require a telegrapher, but then, it does require someone with technical knowledge to adjust and maintain the apparatus. The speed of telephony may be greater, but then, the efficiency of high speed telegraphy is rapidly increasing. On the other hand, electrical power required for communication over any range is much greater for telephony than telegraphy, and the mutual interference between telephony communications is much greater than between telegraphic communications. It is obvious that the ideal for mobile telephone communications is to connect up ships and aircraft by wireless telephony to land telephone services, and although this has been done already in isolated cases on an experimental basis, it is very far yet from being a working commercial proposition.

In comparison with wireless telegraphy, the advances in wireless telephony were extremely slow until about six years ago, when the Three Electrode Thermionic Tube was introduced as a generator of wireless waves. Since then, however, such rapid progress has been made that its great future is already well assured. The principle reason why telephony lagged so far behind was that a continuous radiation of uniform ether waves which could be

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modulated by the voice was essential, whereas in telegraphy a radiation of groups of waves sufficed, a radiation such as was obtained from the spark generators used in all the earlier wireless telegraph transmitters. The first real attempts at wireless telephony were made possible when arc generators and high frequency alternators were introduced. Even these, however, did not produce radiation of exactly the sort required, and it was undoubtedly the introduction of the Three Electrode Tube as a generator that gave wireless telephony a fair start. This tube, or, as it is often called, valve, consists essentially of a vacuum bulb similar to the ordinary incandescent lamp but with two metallic electrodes inside the bulb in addition to the filament. When this instrument is connected with suitable circuits to a source of electric power, electric oscillations, that is, electric currents oscillating at very high speeds, are generated, and when these currents are caused to flow in an aerial, a continuous stream of uniform ether waves is radiated. For telegraphy, these oscillations, and hence the waves, are broken up into short and long groups by a signalling key, corresponding to the dots and dashes of the Morse Code, and for telephony they are modulated by the voice speaking into a microphone, just as the current in the line is modulated in line telephony. A common form of microphone consists of a small chamber filled with carbon granules through which the current flows, the current remaining constant so long as the granules are quiescent but varying in strength, owing to the varying electrical resistance, as the granules are made to vibrate by the voice.—Printed in part from *St. Martins Le Grand.*

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Origin and Development of Radio Service in America

(*Concluded from Page* 441, *October* 1*st Issue*)

As to the Orient, there is a station in California operating with Hawaii and by relay through Hawaii and Japan. The Japanese station is a Government navy station and allocates only a relatively few hours per day to commercil traffic. Therefore, the capacity of the circuits in the Pacific is limited by the capacity of the other end of the system.

No matter how efficient the apparatus may be, the capacity of an international circuit, where someone else owns and controls the other end, is dependent upon the capacity of the stations communicated with.

Japan has now under construction a larger and more efficient station, which will be equipped with alternators. Whether, as a result of this, a greater capacity both in sending apparatus and in hours per day will be obtained is yet problematical.

The stations in Honolulu are being equipped with alternators, with the purpose of making them in all respects the equal of the stations on the Atlantic coast. The station in California will also be equipped with alternators and that work will be completed about the same time.

As to China: At the time the contract was made with the British-Marconi Company it was represented by that company that the rights to radio communication in China had been declared by the Chinese Government a monopoly and that rights had been conveyed to a company by the name of the Chinese Communications Company, one-half interest in which was owned by the Chinese Government and the other half by the British-Marconi Company. In view of that representation it was agreed that the Radio Corporation of America would communicate with the stations of the Chinese Communications Company in China and that the Chinese Communications Company, in turn, would communicate with the Radio Corporation in the United States and with the Radio Corporation of South America in South America.

The Japanese are constructing a radio station in China, and another concern (the Federal Telegraph Company) has been granted a concession for a Chinese station.

If China is to open to others than the Chinese Communications Company for the purposes of radio communication, then the Radio Corporation of America must be at liberty to take such steps as may be necessary to protect the Chinese communications with North and South America.

Now, a word about wave lengths. It is commonly thought that radio communications, being carried on through the air, may be carried on to an unlimited extent. That, unfortunately, is not true. In fact, the spaces in what the scientists call the ether, through which communications may be carried on, are very limited. They are like a limited number of paths.

The total number of wave lengths for long-distance communication available for the whole world are 140, and that the United States made application through the international communications conference for 39. In other words, if the United States were to receive an allocation of 39 wave lengths, the communications, both through the Government stations and private stations, would all have to be carried on through this limited number of roads.

It therefore becomes a matter of first importance from the international point of view that the United States should obtain as large a number as possible of suitable wave lengths, and having obtained them, from a domestic point of view it becomes of maximum importance that these wave lengths be assigned to stations which may make the maximum use of them in the public interest.

The present policy, for example, of the law which permits anyone to build a wireless station anywhere and then come forward to the Department of Commerce with the almost overpowering argument of an enormous investment and demand an assignment of wave lengths, is antiquated and unsatisfactory.

Legislation in some form is recommended which will restrict the right to build these stations unless a Government license allocating a wave length shall first have been obtained.

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Sunspots and Magnetic Storms

By Arthur E. Cotterell

The magnetic storm of May 14 and 15 last, not only affected the needles at the observatories and caused considerable interference on telegraph systems throughout the world, but afforded us another reminder of an unsolved problem of nature. Although we are well acquainted with effects, our knowledge of the causes is very far from being established.

It is true that several plausible theories have been advanced, but terrestrial magnetism is surrounded by so much that is complex, contradictory, or elusive, that none of them can at present be regarded as conclusive.

In the course of my study of the subject there are certain points which have particularly impressed me as adding to the complexities.

It is generally accepted that sunspots pass through cycles in which their maxima or minima respectively are attained on an average of about 11.1 years and that magnetic disturbances are closely in accord therewith; magnetic storms of magnitude being usually coincident with sunspot maxima. Graphs of various observatory records certainly support this theory.

In my estimation, however, the most important storms are not merely those which bring about violent agitations of the needles but those which also induce "earth currents" so strong and variable as seriously to interfere with single wire telegraph circuits, the extremities of which are connected with the earth. Now, although such telegraph circuits are frequently affected by minor "earth currents" the great magnetic storms to which I have alluded occur at very irregular periods and curiously enough, do not coincide with sunspot maxima or minima, as the following table of some of the greatest storms will show:

Magnetic storms affecting telegraphs	Sunspots	
	Maxima	Minima
September 1, 1859	1860.1	1856.0
August 3, 1872	1870.6	1867.2
November 17, 1882	1883.9	1878.9
February 14, 1892	1894.1	1889.6
October 31, 1903	1906.1	1901.7
September 25, 1909	1917.7	1913.1
August 11, 1919		
May 15, 1921		

It is not suggested that there is no connection between spots and storms; the recorded evidence is overwhelming, and on each of the occasions mentioned there was a huge spot or group of spots. The point which I desire to emphasize is that none of these great storms during the last sixty-two years have been coincident with a maximum spot phase if we except the storm of 1859, which did nearly coincide.

As the average interval between sunspot maxima shown in the above table is 11.5 years and minima 11.4 years, it should be stated that the 11.1 years average is based on records taken over a much longer range of years.

The most tenable theory as to the connection between sunspots and magnetic storms appears to be that which was, I think, first advanced by Mr. Maunder, in which it was suggested that streams of electrified particles are ejected from the spotted region of the sun and that these affect the earth's magnetism and set up or start terrestrial currents if such a stream happens to be so directed as to hit the earth's atmosphere. Whilst very largely accepting this view, I am constrained to indicate certain circumstances which present some difficulties when considered in conjunction with the generally accepted graphs which illustrate the connection between magnetic storms and sunspot maxima. It is well known that coronal streamers are comparatively short all over the sun at periods of sunspot maxima and that at periods of sunspot minima there are always long equatorial streamers extending probably beyond earth-sun distance, and that from their direction approximating to the ecliptic such streamers are likely to reach the earth. Examination of them by the spectro-heliograph has revealed their electric or electrified nature. It would, therefore, seem to be curious that magnetic storms should occur when these electric streamers are short, as at times of sunspot maxima rather than on occasions of sunspot minima when the streamers are long. No doubt much may depend on the precise direction of any particular stream, but the conditions to which I have alluded seem to illustrate some of the complexities and contradictions which surround any inquiry into this interesting but elusive subject.

In considering the incidence of sunspots it is a natural thought to question the possible effects of combinations of the planets. Some years ago I made rough computations of their relative positions at various dates of magnetic storm with a view to ascertaining whether the configuration was such as might warrant the assumption that the combined gravitational pull of several in a given direction might be a key to the secret, either as causing the spots or directing the electrified streams. I have recently gone over my figures and added similar details as to later storms.

In a few instances the configurations seem to be suggestive but in others the positions of the planets were such as rather to dispel the thought. I understand that Prof. E. W. Brown some years ago investigated the planetary positions at certain times of sunspot maxima, but although obtaining some extremely interesting results, missed establishing an acceptable theory, owing to certain occasional discrepancies.

If I may venture to tread on speculative ground I would suggest that there is still one field within the Solar system which, so far as I know, has not been explored in this connection, and which in the present state of our knowledge cannot yet be fully investigated. I refer to the minor planets whose orbits lie between those of Mars and Jupiter, not

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as a sole cause, but as a possible contributory one.

I quite realize how comparatively small they are and am aware of the views held by eminent astronomers as to their probable aggregate mass. Their views, however, seem to vary considerably, and can hardly be deemed to be conclusive at the present stage, when we do not know how many asteroids there are. In one respect we have definite information, that is, in regard to the periodic times of a very large number of them which we know vary between some three and nine years.

It follows that they must be continually changing their position in relation to one another, just as runners in a race of several laps change their groupings, from which we may infer that at times they are scattered in the belt of their orbits while at others they may form groups which may conform more or less with the celestial longitude of some of the eight principal planets.

It has naturally happened in the past that special consideration should be given to Jupiter on account of his giant size, the close approximation of his orbital plane to the ecliptic, and not least of all, to his period of 11.86 years so closely approximating to the 11.1 years average of sunspot maxima. On the other hand, it was easy to discard Jupiter, as not only is there a difference in the two periods of .76 of a year, but there would be cumulative differences with succeeding cycles, although after many years they would come into phase again, to be followed with a repetition of the divergencies. Another reason for discarding Jupiter arose from the fact that his time of reaching perihelion can only rarely coincide with sunspot maxima.

Had there been a planet whose periodic time was about 5.74 years its synodic period with Jupiter would have been about 11.1 years.

Seeing that a large number of the known minor planets have periodic times ranging about five or six years, it would not seem unreasonable to speculate as to the possibility that they may be a contributory cause of sunspots in combination with Jupiter.

Recently I attempted a preliminary investigation as to the motions and positions of the first 280 minor planets. The changes of groupings was interesting but not such as I could consider strongly suggestive. As I have already said, however, any such theory cannot be adequately probed until we are possessed with a fuller knowledge as to the many thousands, perhaps millions, of asteroids which it is thought may exist.—*London Telegraph and Telephone Journal.*

Wireless Station for Bowman Hotels

Passengers leaving the port of New York nowadays have the satisfaction of knowing that they no longer leave civilization behind, for the news of the day follows them far out to sea. A digest of the sporting news, the financial news and the general news is now flashed out to sea from the roof of the Hotel Commodore, of the Bowman group of hotels in Pershing Square, New York.

This innovation in hotel accommodation was put to a practical test recently when radio messages began to sputter and splash from the roof of the Hotel Commodore to incoming and outgoing ships for a radius of five hundred miles over the sea.

A powerful and perfect wireless equipment has been installed on the Commodore roof by direction of John McE. Bowman, president of the Bowman hotels. The wireless room has every facility and modern bit of apparatus for sending and receiving radio messages, with expert wireless operators in charge of Marshall C. Wright, chief radio operator. The news of the day is transmitted broadcast to all ships on a wave length of 1900 metres.

The radio installation consists of a medium wave receiver with a two-stage amplifier. The transmission is by remote control, using the Cutting and Washington Radio Station, located at Easthampton, Long Island, New York. A leased Western Union wire from the Hotel Commodore connects the hotel directly with the Cutting and Washington radio station, 100 miles from New York.

The radio station is open from 9 a. m. to 1 a. m. All ship reports are transmitted to the information desk at the Commodore, the Biltmore, Murray Hill, Ansonia, where they are posted. Radiograms may be filed at the information desk of any of the Bowman hotels, from which they will be transmitted to the radio station, or may be telephoned direct to the radio station from rooms in any of the five hotels.

Any vessel with a sufficiently powerful wireless equipment may have the news and are welcome to it, and ships passing each other in the night will be able to pick out of the silent sky the happenings of the world.

How welcome will be this service is known by those who go down to the sea in ships and can be readily imagined by those who stick to the shore. Many devices are resorted to on shipboard to break the monotony of a voyage lasting several days, but the thing for which passengers most hunger is news of the outside world.

In the days before the wireless the most welcome sign at sea was a passing ship, and signals were immediately passed from ship to ship as to the sailing port and destination of each, the number of passengers on board, the weather encountered and any marine intelligence picked up on the voyage.

But the wireless has changed all this, and ships that pass in the night may talk to one another and ships which are miles and miles apart may do the same.

Messages sent from the roof of the Hotel Commodore can be transmitted from ship to ship and relayed across the entire stretch of the broad Atlantic.

The wireless station on the roof of the Commodore is another wonderful Bowman achievement and a great boon to the ocean traveling public. George W. Sweeney, vice-president of the Commodore, will have supervision over the wireless station.

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Telegraph History in 1853

As historian of the Old Time Telegraphers' and Historical Association, we have received from B. Weeks, superintendent of telegraph, Illinois Central Railroad, Memphis, Tenn., a copy of the book on the "Electro-Magnetic Telegraph," by Laurence Turnbull, M.D., printed in Philadelphia, March, 1853. In presenting this well-preserved electrical book of 264 pages to the Old Timers' Association, Mr. Weeks has placed the work where we hope it will be appreciated because of its great historical value as early telegraph history.

On page 72 of the book reference is made to receiving telegraph messages by sound. We quote: "In the earlier forms of registers, an alarm was appended to call the attendant's attention, but this is thrown aside, as the click of the register answers the purpose; some experienced operators become so accustomed to this click that they can declare the message without referring to the character made by the stylus; thus it becomes phonetic, and operators conversing at vast distances, can make the little instrument, by its varied action, slow, rapid, or impetuous, give expression to the different feelings of the mind; each office has its own peculiar signal, known to all the rest on the line, and an answer is expected as soon as it is given."

On page 77 is found an account of a telegraph convention, probably the first that was ever held. It reads:

"A telegraph convention, assembled at Washington on the 5th day of March, 1853, to confer together for the purpose of establishing regulations among the various Morse telegraph companies, so as to increase the farther usefulness of this means of transmission, and to perfect the system to its greatest capacity of good.

The Committee on Resolutions reported on the following points, which were adopted in detail by the convention: First. All words in the body of a message should be counted. Proper names, such as the names of persons, steamers, cities, etc., shall be counted as many words as there are capitals used.

Second. Better means recommended to secure answers to messages sent, and to give priority to messages of inquiry between offices on business.

Third. A reciprocal rule for refunding on lost messages, making the line at fault responsible.

Fourth. To protect the telegraph from abuse by unworthy and unqualified operators, requiring suitable evidence of integrity and capability.

Fifth. A uniform system of numbers and signal letters.

Sixth. The recommendation to decline adopting new letters in the Morse alphabet, but agreed to the transposition of the letters "C" and "K," requiring the dash, dot and dash to be used as "C," and the spaced letter "C" to be used in future as "K."

Seventh. Refusal to adopt any periodical for an official organ of the convention on telegraph.

Eighth. Refusal to adopt the general term of National Telegraph, considering it as a name applied to associated lines.

Ninth. The extension of the patent of 1840 was considered the legitimate business of the patentee.

Tenth. Declined to reduce the tariff of charges by an increase of words.

Eleventh. The appointment of a Committee of Correspondence, to serve until the next convention, to attend to such matters relative to the general interest of telegraph companies, as may be deemed necessary.

Twelfth. No message to be transmitted by any line unless prepaid, except answers to messages, checked "answer paid."

Thirteenth. Recommending the abolition of the practice of sending free messages, except for those actually engaged in the business, and on telegraph business.

Fourteenth. Against the employment of persons without good testimonials of integrity, etc.

Fifteenth. The convention agreed to meet annually, and in Washington, March, 1854

Sixteenth. Recommending offices in same cities to unite, and have one office, common to all.

Much important business was transacted with great unanimity.

The convention in a body called and paid their respects to the President of the United States, at the Executive Mansion, and were courteously received by him. The members composing the convention represented about four-fifths of the telegraph lines of America."

On page 91 we find the following reference to radiotelegraphy:

"An apparatus can, it is true, be constructed in which the inductor, having no metallic connection whatever with the multiplier, by nothing more than the excitation transmitted, will produce galvanic currents in that multiplier sufficient to cause a visible deflection of the bar. This is a hitherto unobserved fact, and may be classed among the most extraordinary phenomena that science has revealed to us. It only holds good, however, for small distances. It must be left to the future to decide whether we shall ever succeed in telegraphing at great distances without any metallic communication at all. My experiments prove that such a thing is possible up to distances of fifty feet. For distant stations we can only conceive it feasible by augmenting the power of the galvanic induction, or by appropriate multipliers constructed for the purpose, or, in conclusion, by increasing the surface of contact presented by the ends of the multiplier. At all events, the phenomenon merits our best attention, and its influence will not perhaps be altogether overlooked in the theoretic views we may form with regard to galvanism itself."

On page 132 is given an account of a submarine telegraph cable laid across the Ohio River at Paducah, Ky. It reads as follows:

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"The great submarine telegraph cable, on the St. Louis and New Orleans telegraph line, was laid across the Ohio River at this place on Monday last, the 26th inst. We examined this strange piece of mechanism a few days previous to the time it was deposited in its watery abode, and were not a little astonished at its wonderful strength.

It is composed of a large iron wire, covered with three coatings of gutta percha, making a cord of about five-eighths of an inch in diameter.

To protect this from wear, and for security of insulation, there are three coverings of strong Osnaburg, saturated with an elastic composition of non-electrics; and, around this, are eighteen large iron wires, drawn as tight as the wire will bear, and the whole is then spirally lashed together with another large wire, passing around at every ¾ of an inch. The whole forms a cable of near two inches in diameter, and it is much the largest and most substantial cable of the sort in the known world.

We are told that the great cable across the channel from England to France is inferior in size to this, and by no means as well insulated for electrical applications; while in point of strength it will not compare at all with the one at this place. The British wire across the channel is surrounded by eight wires only, while ours has eighteen. Ours is spirally lashed, while the British is not. The electric wire in the British cable has but one coating of gutta percha, while ours has three, and is altogether superior in every particular.

This stupendous wire, which now conducts the lightning from shore to shore, beneath the bed of the majestic Ohio, is 4,200 feet in length, and the longest one to be found in the United States. It has been constructed by that amiable and accomplished gentleman, Tal. P. Shaffner, Esq., late president of the company, and now secretary of the American Telegraph Confederation, assisted by J. B. Sleeth, mechanical engineer. These gentlemen have made improvements in the construction of cables, both scientific and mechanical, which will entitle them to letters patent, and the country may well be proud of them as men of skill and ability in whatever they may undertake.

The wires on this line, we understand, have been exceedingly troublesome and expensive to the company, upward of $20,000 having been expended in unsuccessful efforts to cross the rivers in such a manner as to secure them against accidents; but this great effort has accomplished the object, and there can be no future loss sustained on account of breakage of mast, wires, etc."

[A two-foot sample of this cable is in possession of TELEGRAPH AND TELEPHONE AGE, and is on exhibition in its office.]

OUR readers should remember that when they have occasion to communicate with advertisers, it is important that they mention TELEGRAPH AND TELEPHONE AGE. The advertisers appreciate this courtesy.

Daniel S. Robeson, Line Constructor

Daniel W. Robeson, the well-known former line constructor of Philadelphia, Pa., in remitting to cover his renewal of subscription to this publication writes: "Renewing my subscription to the AGE always causes my thoughts to revert to old friends and comrades of the troublous construction days of the American Rapid Telegraph Company, the Mutual Union Telegraph Company, the New England Telegraph Company and the Postal Telegraph Cable Companies, covering the period from 1875 to 1895, but few of whom are left. George M. Myers, Kansas City, of the Mutual Union, C. M. Baker, Chicago, of the Postal, Arthur Campbell of the Mutual Union, later of the American Telephone and Telegraph, and J. D. Case of the Bankers and Merchants were among the valiant operators and line builders of that period that are still on terra firma.

I want to congratulate you on having made the AGE of such value in its broad scope to the rising generation of the fraternity. 'Like old wine, may it continue to improve by age.' I wish you health and happiness."

Mr. Robeson is probably the oldest former line builder in this country, with the exception of C. W. Gulick of White River Junction, Vt. Mr. Robeson was born at Belvidere, N. J., August 13th, 1841. At an early age he became a dominant figure in the telegraphic world, and during the exciting fighting telegraph construction period from 1875 to 1895 was prominent in the competitive achievements of the day as a contractor and general superintendent of construction, as previously referred to by Mr. Robeson. In addition to the interests mentioned, Mr. Robeson constructed the lines for the West Shore Railroad Company, from Weehawken, N. J., to Buffalo, N. Y., and was general superintendent of the Pacific Postal Telegraph Company at San Francisco. He also built the original lines of the Postal Telegraph Company south of the Potomac and the Ohio Rivers.

He was noted for his executive ability, perseverance and resourcefulness to overcome the difficulties constantly arising in telegraphic construction work in the old days.

Mr. Robeson has been engaged in a by-product manufacturing business for many years past, and is still very active in that line.

Longitudes on the Baltimore and Ohio Railroad

By DAVID HOMER BATES

In your October 1st issue, on page 443, there is an article by Rear Admiral W. H. G. Bullard, entitled "Washington Greenwich Longitude," which reminds me of the experiments in 1862 by Professor Dean, of the United States Coast Survey, to determine the longitude of certain points on the Baltimore & Ohio Railroad, between Washington, D. C., and Cincinnati, Ohio.

Professor Dean came to the War Department telegraph office night after night and compared signals with his operator at the distant end of the wire. I was present and aided in the experiments.

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The Brazilian Telegraphs

The birth of Brazilian telegraphy was due to the untiring efforts of Eusebio de Queiroz Coutinho Mattoso Camara, aided by a competent helper in the form of the professor of physics, Dr. Guilherme Schuh, writes W. H. Gatehouse in the *London Telegraph and Telephone Journal.*

The initial stages of the telegraph service were inaugurated in 1852, but for a number of years developments did not proceed with great rapidity. However, the outbreak of the Paraguay War (1865-1875) necessitating speedy communications, added great stimuli to the efforts of prominent engineers. In 1874 communication was established between Rio and Victoria (Espirito Santo), the next year saw Parahyba linked with the capital. The towns of Fortaleza 1881, Therezina 1884, and Para 1886, were thus connected in the early part of the next decade.

Internal lines were constructed about the same time at Curityba, Sao Paulo, Porto Alegre, and to the frontier of Uruguay at Jaquaraa.

The physical features of the country, however, are such as to present formidable barriers to the telegraph engineer. This led the State to obtain the services of the Amazon Telegraph Company for the purpose of laying cables in the River Amazon. The principal cable commenced activity on February 16, 1896, and served for providing Para and Manaos with direct communication. By this time all the capitals of the various States forming the Republic were in telegraphic communication as well as towns, which were actual hubs of commercial activity. Progress was rapid, and each succeeding year saw further and greater development in telegraph construction.

The guiding influence and administration are in the hands of the Ministry of Public Works.

Not content with merely being alive to the necessity of adequate communication, the Ministry has keenly followed the example of European Administrations, and experiments were exhaustively carried out towards reaching the highest pinnacle of efficiency possible for maintaining a thoroughly reliable system.

In 1877 Brazil became an adherent to the International Convention of St. Petersburg.

The instrument extensively favored was, and I believe still is, the Werner-Siemens polarized apparatus. Prior to this, Stohrers double Morse and Breguets with dial plates were originally the apparatus employed. 1885 saw Wheatstone apparatus in the service, followed in 1889 by the trials of modified Hughes-Maeyers automatic Morse, duplex with alternating currents, and Siemens quadruplex. Steljes failed to give satisfactory results in 1894. November 15, 1897, was a red-letter day, for on this date the Baudot was installed between Rio Janeiro and Sao Paulo. This inauguration after severe trials met with success, for exactly four years later a similar communication was established between Rio, Bahia and Pernambuco, the distance covered being somewhere in the region of 1,000 miles. A further development became operative in 1903 in a southerly direction between Rio and Porto Alegre and by repeater to Curityba with extensions to Pelotas and Rio Grande. The town of Fortalezza received Baudot double (or triple) installation on April 15, 1905, bringing up the distance of lines covered by this successful system to approximately 3,500 miles. The Hughes Printing Telegraph System, as we kow it, did not meet with the same degree of success. Installed in 1900 at the central office (Rio) and at Petropolis and Juiz de Fora, it met with but very little success. The reason is not definitely known, but exponents of the Hughes art would undoubtedly ascribe technical difficulty and incomplete tuition or inaptitude of operators as having some bearing upon its shelved position.

With regard to external communication, the directorship, maintenance, etc., is in the hands of several "Societies des Telegraphes." Northerly, the cables are under the auspices of the French Transatlantic Telegraph Company, whose cables land near Salinas and the State of Para, and the South American Company, and the Western Company, whose cables land at Pernambuco. In the southerly direction transit is provided by the cable of the Western Company, and aerial wires by way of Uruguay and the Argentine Republic.

The Eastern Telegraph Company also, through the mutual agreement of the governments of the three republics, Brazil, Argentine and Uruguay, in 1899 provided a very important link with the outside world. The object of the inauguration of the French Transatlantic cable was to facilitate communication between Viven (Para) and the United States. Commencing activities in 1892, the cable end had to be shifted at least twice on account of the powerful current at the mouth of the Amazon playing havoc with the shore end.

It was finally restored in 1907. The overland route passes from Porto Alegre and by three channels, these being—(1) Normal, by way of the Argentine. (2) Appointed, through the medium of the Eastern Telegraph Company's lines. (3) Optional, by the lines of the National Telegraph of Uruguay.

Also, to provide against isolation consequent upon possible interruption of the recognized routes, an auxiliary line can be linked up by way of Quarahy-Santo Eugenio.

Before the advent of wireless, following the introduction of the electric telegraphs, messages were transmitted to and from ships by means of an elaborate system of semaphores round the coast, these were all linked by telegraph or telephone to the normal land lines. The more modern means has now replaced or is replacing the older and more cumbersome system.

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Almost every telegraph and telephone department of foreign governments subscribe for TELEGRAPH AGE. Some subscribe for as many as twenty-five copies of the paper to meet their requirements.

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Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps

The Old Time Telegraphers' and Historical Association and the Society of the United States Military Telegraph Corps will hold their joint annual reunion at the Hotel Jefferson, Richmond, Va., on October 18th, 19th and 20th.

The local committees at Richmond, headed by General Jo Lane Stern, president of the Old Timers, desire a large attendance. Richmond is prepared to give all delegates a royal welcome, and every member who can be present should at once communicate with General Stern, who is Adjutant General of the State of Virginia, to make the necessary hotel reservations, etc.

Thomas E. Fleming, 195 Broadway, New York, is secretary and treasurer of the Association.

Franklin J. Scherrer, Room 1929, 30 Church Street, New York, is arranging to have a special Pullman car for the New York delegation attached to the train leaving the Pennsylvania Station, Seventh Avenue and 33rd Street, 8.45 p. m., Monday, October 17th, arriving at Richmond, Tuesday, 7.10 a. m.

This will be the 38th reunion of the Old Timers and the 58th anniversary of the Society of the United States Military Telegraph Corps.

The Old Time Telegraphers' and Historical Association was organized at Cincinnati, Ohio, in 1880. Colonel Robert C. Clowry, then of Chicago, in a letter addressed to various telegraph people, suggested the formation of the Association and he gave it its name. The reunions have always been a success from the start.

A list of the meeting places, the names of the presidents, and the secretary and treasurer, will in this connection be of value at this time, as it shows that the reunions have taken place in almost all sections of the United States and Canada. They are:

1880—Cincinnati, O.; O. H. Booth, president; J. C. Mattoon, secretary and treasurer.

1881—No meeting on acount of death of President Garfield.

1882—Niagara Falls, N. Y.; O. H. Booth, president; J. C. Mattoon, secretary and treasurer.

1883—Chicago, Ill.; W. R. Plum, president; J. C. Mattoon, secretary and treasurer.

1884—St. Louis, Mo.; G. M. Dugan, president; S. B. Fairchild, secretary and treasurer.

1885—New York, N. Y.; C. W. Hammond, president; S. B. Fairchild, secretary and treasurer.

1886—Cleveland, O.; J. D. Reid, president; W. J. Dealy, secretary and treasurer.

1887—Philadelphia, Pa.; C. C. Hine, president, W. J. Dealy, secretary and treasurer.

1888—Chicago, Ill.; David Brooks, president; W. J. Dealy, secretary and treasurer.

1889—Louisville, Ky.; Chas. E. Taylor, president; W. J. Dealy, secretary and treasurer.

1890—Kansas City, Mo.; Day K. Smith, president; W. J. Dealy, secretary and treasurer.

1891—Washington, D. C.; G. C. Maynard, president; W. J. Dealy, secretary and treasurer.

1892—Omaha, Neb.; E. Rosewater, president; W. J. Dealy, secretary and treasurer.

1893—Chicago, Ill.; A. H. Bliss, president; W. J. Dealy, secretary and treasurer.

1894—Baltimore, Md.; Chas. Selden, president; W. J. Dealy, secretary and treasurer.

1895—New York, N. Y.; E. C. Cockey, president; W. J. Dealy, secretary and treasurer.

1896—Pittsburgh, Pa.; S. A. Duncan, president; W. J. Dealy, secretary and treasurer.

1897—Nashville, Tenn.; James Compton, president, W. J. Dealy, secretary and treasurer.

1898—Omaha, Neb.; J. J. Dickey, president; W. J. Dealy, secretary and treasurer.

1899—Boston, Mass.; H. J. Pettengill, president, John Brant, secretary and treasurer.

1900—St. Paul and Minneapolis, Minn.; H. C. Hope, president; John Brant, secretary and treasurer.

1901—Montreal, Can.; L. B. McFarlane, president; John Brant, secretary and treasurer.

1902—Salt Lake City, Utah; G. H. Corse, president; John Brant, secretary and treasurer.

1903—Milwaukee, Wis.; U. J. Fry, president; John Brant, secretary and treasurer.

1904—Atlanta, Ga.; C. C. Adams, president; John Brant, secretary and treasurer.

1905—New York, N. Y.; John C. Barclay, president; John Brant, secretary and treasurer.

1906—Washington, D. C.; W. H. Young, president; John Brant, secretary and treasurer.

1907—No meeting.

1908—Niagara Falls, N. Y.; H. D. Reynolds, president; John Brant, secretary and treasurer.

1909—Pittsburgh, Pa.; G. A. Cellar, president; F. J. Scherrer, secretary and treasurer.

1910—Chicago, Ill.; W. J. Lloyd, president; F. J. Scherrer, secretary and treasurer.

1911—Atlantic City, N. J.; Wm. B. Wilson, president; F. J. Scherrer, secretary and treasurer.

1912—Jacksonville, Fla.; Wm. S. Jordan, president; F. J. Scherrer, secretary and treasurer.

1913—Detroit, Mich.; H. J. Kinnucan, president; F. J. Scherrer, secretary and treasurer.

1914—Kansas City, Mo.; Geo. M. Myers, president; F. J. Scherrer, secretary and treasurer. (No meeting on account of World War.)

1915—New York City; Andrew Carnegie, president; F. J. Scherrer, secretary and treasurer. (No meeting on account of World War.)

1916—New York City; Andrew Carnegie, president; F. J. Scherrer, secretary and treasurer.

1917—Cleveland, O.; Wm. H. Canniff, president; F. J. Scherrer, secretary and treasurer. (No meeting on account of World War.)

1918—Cleveland, O.; Wm. H. Canniff, president; J. B. Taltavall, secretary and treasurer. (No meeting on account of World War.)

1919—Cleveland, O.; Wm. H. Canniff, president; J. B. Taltavall, secretary and treasurer.

1920—Toronto, Ont.; Geo. D. Perry, president; T. E. Fleming, secretary and treasurer.

1921—Richmond, Va.; General Jo Lane Stern, president; T. E. Fleming, secretary and treasurer.

Telegraph and Telephone Life Insurance Ass'n

Assessments 707 and 708 have been levied by the Telegraph and Telephone Life Insurance Association, New York, to meet the claims arising from the deaths of David E. Rand, Silver Hill, Mass.; Henry C. Sprague, Kansas City, Mo.; Charles F. Bartlett, St. Louis, Mo.; William L. Ives, Syracuse, N. Y.; George A. Joyce, Albuquerque, N. M.; Arthur P. McArdle, Detroit, Mich.; Franklin W. Coleman, Paterson, N. J., and Ethelbert B. Crawford, Tusten, N. Y.

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Observations by J. McMillan While Abroad

J. McMillan, general manager of the Canadian Pacific Railway Company's Telegraphs, Montreal accompanied by his wife and daughters, the Misses Hazel and Myrtle McMillan, left Montreal on July 1st for a visit to England, Scotland and France. Arrived in Liverpool on July 10th and made the trip to Scotland, visiting Edinburgh, Glasgow, Aberdeen and made quite a lengthy visit to the Island of Islay, where Mr. McMillan has relatives.

When visiting England, he made a lengthy stay in London. He also visited France—Paris, the battlefields in the Arrass, Vimy Ridge section, and Lille and Ypres sections.

While on the other side he paid very close attention to the types of telegraph lines, offices and service in general. The conditions in the telegraph world, said Mr. McMillan, are so very different to what they are in Canada and the United States, that it is rather difficult to make any comparison. In Great Britain the distances are not to be compared with the distances in this country. For example, Eastern Canadian points being 4,000 miles from Western Canadian points and the difference in time being four hours, means that it is necessary for people in Canada or the United States to use the service during the night hours. In Great Britain there is not the night service that we have in this country; as a matter of fact, in London and Glasgow the majority of branch offices are closed, and those wishing to send telegrams at night, must make quite long trips to the main offices.

The construction of lines differ greatly from our lines, the poles being placed from sixty to eighty and ninety yards apart. As the number of wires increase the span is not shortened, but the construction is of a double pole type, a type of line that would be disastrous for us to adopt in this country, the loading with sleet would mean the prostration of wires, even if the supports were not destroyed.

In France the lines are peculiar in that they use a great many two pin brackets, the brackets being fastened to one iron rod which is fastened to the pole by two screws. In France they have greater cross-arm capacity than they have in England, but wherever the cross-arm capacity is increased, double poles are used. In England there may 20 or 30 cross-arms on a pole line with what seems to be 12-inch centers, the cross-arms being closer together than we have them in this country, but the great number of cross-arms mean a longer pole and an increase in costs. Another striking peculiarity about their lines, even two and three wire lines along the railways is that every pole is double anchored, tending to expensive construction.

Outside of the brief reference to the actual points visited, the trip was of peculiar interest, as Mr. McMillan was able to visit places in Scotland where he attended school, and was delighted to meet there cousins on his father's side, and in England cousins on his mother's side, his mother having been born in Rochdale, while Mr. McMillan claims Liverpool as his birthplace. The trip from the time of leaving Montreal on the morning of July 1st, until his return to Montreal on the evening of August 26th, was one in which there was not a single unpleasant incident. The outing was delightful.

While in London he had the pleasure of visiting the central telegraph office, which is under the able management of John Lee. In this office there is a staff of 5,000 employees.

Conditions in Great Britain are peculiar, continued Mr. McMillan, the war having created exceptionally high rates in regard to labor. The war was a great struggle which taxed the nation to the utmost. It is quite evident that the people denied themselves and suffered, and it seems that following the Armistice the Briton has been inclined to relax, in other words, to have a period of rest, and he seems a little slow in getting down to business. When, however, the British people are ready to face the conditions as they exist, moderate labor demands and get down to work, England will, in my opinion, quickly resume her place in all commercial enterprise, and in commerce, as in war, be successful.

Marconi Wireless Telegraph Company of Canada

The annual report of the Marconi Wireless Telegraph Company of Canada for the year 1920, issued a few days ago, states that the General Electric Company of Canada had assigned to the company all of its exclusive rights to all Canadian and Newfoundland patents owned by it. The consideration was 800,000 shares of new stock. This insures the co-operation of the General Electric Company, which has already proved beneficial to the Marconi Company. The Canadian General Electric Company also undertakes to subscribe for a further 200,000 shares at par, as additional working capital is required.

The company is in accord in working arrangements with the British Marconi Company.

The financial statement shows that the profits from operation for the year, after deducting all expenses of operations and management, but before providing for depreciation and government taxes, were $69,906.38. From this was deducted $55,449.41 reserve for depreciation of buildings, plant and equipment and power and ship stations, leaving a balance of profits of $14,456.97, to which was added the surplus balance at December 31, 1919, of $395,918.30, making a balance at December 31, 1920, subject to Government taxes, of $410,375.27.

Navy Radio With Japan

The naval radio is now conducting experiments by which it is hoped direct wireless communication with Japan can be established before the meeting of the arms parley. A naval station in Alaska and Japanese Government stations now are exchanging signals.

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY

By Louis Casper

Lesson 37

It is obvious that in a polar duplex circuit operating either as a Morse or automatic system, the positive and negative potentials as they are alternately impressed upon the line by a pole-changing medium should initially be identical in voltage value.

This applies to currents coming from either a motor-generator, storage battery, or a three-wire direct current system.

In general practice it is the duty of supervising wire and repeater chiefs to closely observe indicating meters that are connected to any of the sources of power just mentioned, and to promptly correct any variation that may occur.

Voltmeters and ammeters are provided for ascertaining the voltage and current of the primary power and of the generating ends of motor-generators. For convenience in supervision, individual instruments of small pattern are now being furnished for each generator unit. It is considered that the gain in better supervision resulting from the use of small individual meters instead of one voltmeter for a number of machines, as in the old method, more than offsets the first cost of the increased number of instruments.

The standard method of conveying current from a source of power to any telegraph circuit whether it be for main line or local operation is to insert a resistance in the branch taps that lead to each individual circuit. In the case of a local circuit the value of the resistance is determined by the amount of current the circuit requires for its operation. For main line duplex operation, however, the values are somewhat arbitrarily fixed and are primarily governed by the voltage employed. The resistances used for this work are usually resistance lamps and resistance units.

The lamps are tubular in form and are specially made for resistance purposes in connection with telegraph circuits. The bulbs are generally of clear glass, inside of which a carbon filament is mounted. Each lamp is thoroughly exhausted of air in a similar manner to that in regular incandescent lamps used for lighting purposes.

Resistance units consist of a porcelain spool wound with one layer of resistance wire protected from mechanical strains and chemical depreciation by being imbedded in a solid covering of enamel. The resistance wire is a metallic alloy, the resistance value of which is very little affected by high temperature as compared with other metals. It is also non-corroding under varying tempertaures to which it is subjected. The terminals of the resistance wire are soldered to a standard Edison screw base for one type unit and to brass ferrules in another.

These resistances are necessary, first, to limit the current in the operating circuit, and, second, to prevent an abnormal current from rising should a low resistance ground or short circuit occur due to arcing at contact points or other causes. In addition to lessening the strain upon the generator or storage battery, these resistances serve as protection of the apparatus.

Resistances in battery leads serve still another useful purpose; that of tending to steady the currents in all other branches feeding from the same motor-generator or storage battery. Whenever a short circuit occurs in a branch if the resistances were omitted from the branch leads each of the latter would be subject to a potential drop whenever there would be a sudden abnormal drain upon the generator due to a low resistance ground or short circuit in any particular branch. With properly proportioned resistances in each of the branches, the current flow in such circuits will be steady and constant regardless of heavy drains upon the motor-generator as long as the capacity of the same is sufficiently large to deliver the output required.

This is illustrated in Fig. 104, which shows two motor-generators of opposite sign that supply operating current for one duplex and four single line circuits. A resistance R is inserted in each of the single line circuits, L^3, L^5, L^4, L^6, between the motor-generators and the lines, and in the duplex circuit the resistances R are located in each branch leading to the polechanger P. C.

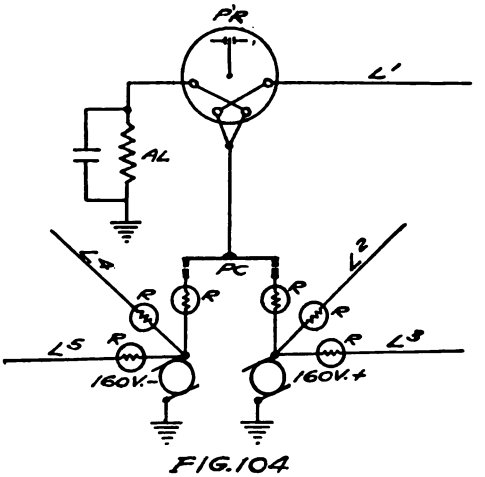

FIG. 104

The operating current by this means is proportioned to the resistance in each individual circuit without perceptible interference one with another.

It is apparent that any number of circuits may receive current from either motor-generator if arranged as shown in Fig. 104, the limitation being only the size of the machine as already intimated.

It is quite important, especially with high speed circuits, that the resistances in duplex battery leads should measure approximately the same, and also that the ohmic value of such resistances be as low as is consistent with safety as well as to fulfill the conditions necessary for efficient current distribution as already outlined.

The necessity for this is explained in the diagram

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(Fig. 105), showing a standard theoretical duplex circuit with two terminal stations A and B. It will be noted that the resistance in each of the battery leads at both stations is fixed at 150 ohms. With this resistance in the branches between the "split" S. and the ground generators D^2 and D^4 at either terminal the current has a value approximately of 84 milliamperes based on an initial e. m. f. of 80 volts. In these two particular branches the current value is greater than at any other section of the circuit at the moment when the existing conditions prevail, as shown in the figure. In this case the key at station A is on spacing, thus connects a positive pole to the line, and the key being depressed at station B presents a negative pole to the line.

When this phase in the operation of the circuit occurs, the battery lead resistance becomes an important factor in that it controls the amount of potential drop in the branch section below the "split" point S. The e. m. f's. generated by each of the dynamos D^2 and D^4 have suffered a drop of 12.6 volts when they have reached the "split" point S, based on ohms law that the current (84 milliamperes) times the resistance (150 ohms) equals the potential drop (12.6 volts). In other words, the impressed e. m. f. is only 68 volts when the current starts to divide between the main line and artificial line branches of the circuit. The

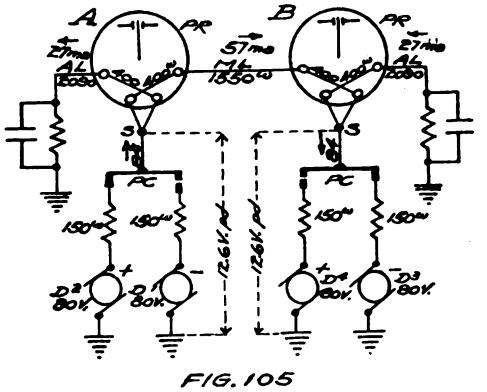

FIG. 105

same condition would exist insofar as e. m. f. and current values are concerned if at station A the key was closed, thereby sending a negative pole to the line, and at station B the key was open, which would convey a positive pole to the line. The difference would be that the relay at station A would be at marking, which is the reverse of the condition to that shown in Fig. 105.

Should all the battery resistances be increased, say, to 300 ohms, each, then, by the same calculation—300 × .078—the drop would be 23.4 volts from both generators D^2 and D^4 to the dividing point S, thus reducing the effective e. m. f. to 56.6 volts at each point where the current divides between the main and artificial branches.

If by some inadvertence the battery resistances were made unequal, let us assume that a 150 ohm resistance unit was inserted in the positive lead and 300 ohms in the negative side, the potential drop would alternate from the point S from one value to another, which would result in the transmission of current waves of varying amplitudes upon the line in the direction of station B, assuming that the resistance at station A were at fault. This obviously would be an undesirable condition in circuit operation.

*In further description of the theory of the duplex the reader is referred to the specifications issued by the telegraph companies and to standard text books on the subject.

*At such times when the keys at stations A and B are simultaneously at spacing or at marking, there would be no actual current flowing on the line. In such an event the current flow is purely local and does not divide at the point S, but flows in one direction only: *i. e.*, through the artificial line coil of the relay and from thence to the artificial resistance and finally to earth. At such moments when this occurs, the question of potential drop does not figure, since no actual "split" point or divided circuit flow exists at this particular interval.

(*To be continued.*)

Seutter's Radio Score Perfect

Exceptionally good showings were made on September 28th by the thirty-nine radio operators competing in the elimination contests for the American open wireless championship at the electrical show in the 71st Regiment Armory, New York.

The best record was made by B. G. Seutter of the transatlantic wireless service station of the *New York Times*, who took 44.3 words per minute without an error.

George C. Otten of the Radio Corporation of America received the same matter with two errors.

Jose Seron of the Radio Corporation of America received the same matter with three errors.

New Wireless Station Near Moscow

A large wireless telegraph station is being erected near Moscow, Russia. The purpose of the Russian People's Commissariat of Posts and Telegraphs is to install apparatus that will enable Moscow to speak simultaneously to every place on the face of the earth. The apparatus is being made in the big radio laboratory and works at Nijni-Novgorod, under the supervision of a band of Russian scientists. During Russia's recent years of isolation her radio progress has been remarkable. Most of the experts are not Bolsheviks, but are enthusiasts for research and eager to develop the possibilities of wireless. Russia is covered by an efficient network ot 597 wireless stations, says the London Daily *Mail*, which keep Moscow in instantaneous touch with what is going on all over the country and in Siberia and Turkestan.

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EDITORIAL COMMENT

Mr. Edison on the Times

To assure general prosperity, Thomas A. Edison says that it remains only for the people to banish fear and pessimism, make the necessary sacrifices and all put their shoulders to the wheel.

Our economic machine is out of adjustment just now, the inventor said, but is all right and will work as soon as it is properly adjusted. He compared the situation to a traffic block, in which the return of movement seems impossible for every unit, because each is stopped by another, which in turn is made helpless by still another; but by a little backing here, or a turn there, finally a way is opened and the tangle is smoothed away.

Mr. Edison said he believed that the unemployment situation had been exaggerated and that a comparison of the number of idle workers of 1914 and 1921 shows no tremendous discrepancy.

Four Countries to Develop World's Radio Facilities

An international radio company for the control and development of the greater part of the world's radio facilities, was organized in Paris, France, during the previous three weeks, by representatives of the radio interests of Great Britain, France, Germany and the United States. Daily conferences were held by the delegates, who finished their work on October 8th.

The American delegation is headed by Owen D. Young, vice-president of the General Electric Company, and includes Edward J. Nally and J. W. Elwood, president and secretary, respectively, of the Radio Corporation of America, and a large staff of experts. The Westinghouse interests also were represented.

It has been estimated there are about 150 wave lengths available, covering the world, and one of the problems of the meeting is to divide these waves among the various countries. Another aim is to make radio available for the daily transmission of world news, assuring to news interests the same certainty of delivery as cable companies now are able to give, but at a lower cost.

With an international agreement and the funds to be placed at the disposal of the company, the experts say this can be done. As the United States initiated the meeting, it is expected American interests will have the most prominent part in the proposed company.

The American Telephone and Telegraph Aerial Cable Connecting New York and Chicago

The American Telephone and Telegraph Company has completed its aerial cable between New York and Pittsburgh, and during the coming year or early in 1923 it will be completed to Cuyahoga Falls and Cleveland, Ohio. It will be extended from Cleveland to Chicago within the next following four years. This cable is full size, measuring two and five-eighths inches in diameter. It approximately contains 290 telephone circuits and 175 telegraph circuits, or the equivalent of eight 50-wire pole lines. The cable is placed on poles except when passing through cities it is underground. This cable will greatly facilitate long distance communication between the East and the West.

This long cable has not been made possible by one or two developments, but by the co-ordination of diverse forms of apparatus and equipment. Besides the recently developed vacuum tube and loading coil which have furnished great help in the development, there have been the quadded cable, phantom repeating coils, two-wire and four-wire repeater circuits, new telephone signaling and telegraph systems, composite sets permitting simultaneous telephone and telegraph messages and special types of aerial construction.

THE length of the cable from New York to Chicago will be approximately 900 miles. There will be 17 repeater stations. The four-wire type of repeater is to be used on the circuits, extending the full length of the cable, while two-wire repeaters are to be used for intermediate circuits. The approximate number of repeaters in each of the 17 offices will be 100.

Each of the pairs in the cable, in addition to being utilized for telephone circuits, will also provide accommodation for a metallic-circuit duplex telegraph channel.

Loyalty

It is an old saying that an ounce of loyalty is worth a pound of brains. Whether or not this is true, I do not know; but I do know that most successful employers feel that way. Hence, be loyal. Cultivate loyalty. Stick by the ladder by which you climb up. Never kick it down.

Don't gossip about your employer or any of his associates. Say nothing that you would be unwilling to have him hear. He will forgive you for making mistakes, but he will not forgive disloyalty. Loyalty bears the same relation to a successful organization that mortar bears to a brick building.

Most men have secured their present positions of trust and power by being loyal to their employers. Most employers select men for promotion, not according to their education, alertness or so-called ability, but according to whether or not they like these men. Now the basis of friendship is loyalty.

Loyalty can be developed or lost like any other trait. You can train yourself to say and do only loyal things, or you can become careless and indifferent about what you say. By all means, don't try to ride two horses at the same time. Cut out all office politics. Trust your employer absolutely or else resign and go elsewhere.

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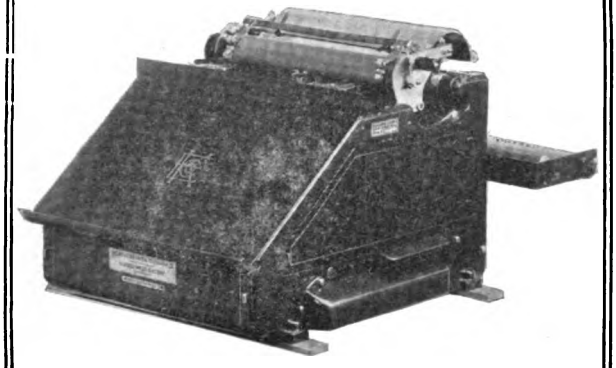

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THE UNIVERSAL SELECTOR
FOR
TELEGRAPH AND TELEPHONE

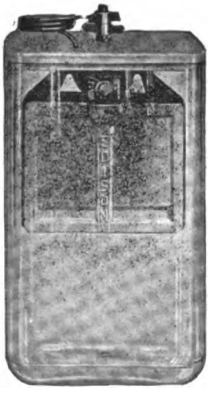
The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.



EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,
Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.
1205 Hobart Bldg., San Francisco, Cal.
2044 Railway Exchange Bldg., St. Louis, Missouri.

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THE RAILROAD

Telegraph and Telephone Section of the American Railway Association

Report of Sub-Committee B—Wire Crossings, Telegraph and Telephone Section of the American Railway Association, held a meeting at the office of W. A. Fairbanks, secretary, New York, on October 6th. Those present were: H. A. Shepard and H. U. Lord, New Haven; G. A. Cellar, Philadelphia; F. G. Adams and C. A. Plumly, Baltimore; E. C. Keenan, L. S. Wells and Stanley Rhoads, New York. In addition to these members of the committee, there were present J. H. Moore and E. Weller of the engineering department of the American Telephone and Telegraph Company, and C. P. Sidler of the engineering department of the Western Union Telegraph Company, New York.

The committee went over its report, which was presented at the Cleveland session, and also the supplemental report, which contained a number of changes, and the committee co-ordinated the two. The paper is now being put into shape preparatory for letter ballot vote for inclusion in the manual, as recommended practices.

A special Committee on Rules and Organization will hold a meeting at the office of W. A. Fairbanks, secretary, New York, on Thursday and Friday, November 17th and 18th.

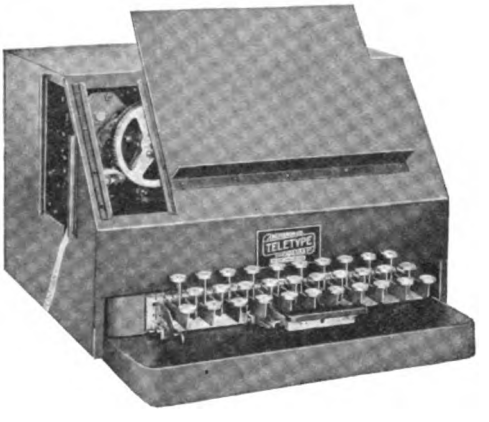
Some Phases of Railroad Telegraph and Telephone Engineering

The paper entitled "Some Phases of Railroad Telegraph and Telephone Engineering," by Stanley Rhoads, Telegraph and Telephone Engineer, New York Central Lines, New York, presented at the Cleveland session of the Telegraph and Telephone Section of the American Railway Association on September 22nd, and which appeared in abstract form in our issue dated March 1st, has been discussed by William Maver, Jr., of New York, the well-known electrical engineer. Mr. Maver's observations on duplex and quadruplex workings are interesting, and we are therefore printing his remarks in full herewith. He says:

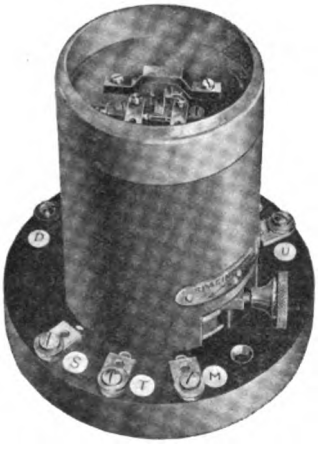
I must take the opportunity to express appreciation of Mr. Rhoads' valuable paper, which I am sure will be found of much utility, not only by the members of the Telegraph and Telephone Section of this Association, but also by other electrical engineers.

The paper touches on so many features that one must perforce limit himself to those which most interest him, which, in my case, are certain of the sections relating to telegraphy. Mr. Rhoads states that he has found the studies and analyses described in his paper very absorbing. From my own experience, I can duplicate his remarks, since over

SLIP BASE WHEATSTONE RELAY


TELETYPE

JACKS


WHEATSTONE RELAY

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thirty years ago I devoted much time to an analysis of the various changes occurring in the operation of the duplex and quadruplex systems, many of the results of which I have recorded in my writings. Mr. Rhoads apparently preferred the oscillograph in his investigations, and of which he has made excellent use. I had to be content with the aid of diagrams and graphics which, however, I certainly found very useful. It may, in this relation, be of interest to state that after devoting several months to these analyses, I found I was able to call up in my mind and to analyze the action taking place in the circuits under almost any given condition, even without graphics, somewhat analogously, as I have heard that some train despatchers can see in their mind's eye every train in their division and its place on main tracks and on sidings.

In my comments on Mr. Rhoads' paper, if I should in one or two instances appear to express different views from those of the paper, it will be solely in the interest of what appears to me the further promotion of fuller knowledge of the telegraphic art, which the author laudably mentions as one of the objects of his paper. Mr. Rhoads further mentions in his opening remarks that a difficulty confronting the engineer in the investigation of a problem is to learn the state of the art in relation to the particular problem in hand, and that the information presented by him is intended to ameliorate that difficulty. To the same end I shall endeavor here and there to supplement Mr. Rhoads' information on certain points.

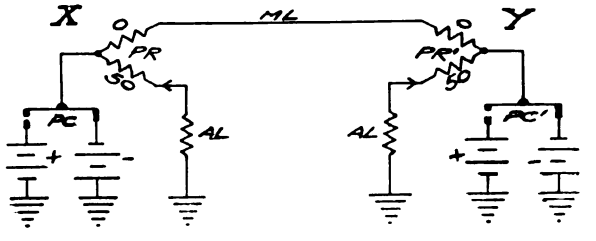

FIG. 1

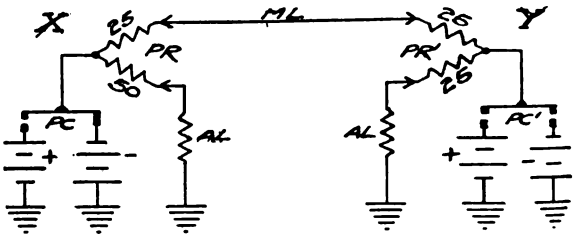

FIG. 2

Mr. Rhoads states that one of the factors detrimental to good quadruplex results and also to polar duplex working is the tendency for the polar relay to write heavy when the home polar key is closed and light when it is open, caused by the distant pole changer armature travel being too great, or its speed of travel too slow. Mr. Rhoads gives an analysis of the conditions that in his view cause the said defect. In my varied and extensive practical experience with duplex and quadruplex telegraphy I have never observed the light and heavy writing to which Mr. Rhoads refers. I am quite sure that it did not exist prior to 1890 in commercial telegraphy. I do not, however, gainsay Mr. Rhoads' statement, because there must be reason therefor. In his analysis, Mr. Rhoads assumes, among other conditions, that during the time the distant pole changer is between contacts the amount of current on the main line is negligible and draws therefrom certain conclusions. A different analysis of the same subject may show that this is not necessarily so. Thus, assume the case of a differential polar duplex without other line apparatus than is outlined in figures 1, 2, 3; let XY represent the home and distant station; ML and AL the main line and artificial line, respectively; PR, PR', the home and distant polar relay, and PC, PC', the home and distant pole changers. In Fig. 1, assume both pole changers to be closed, putting negative batteries to line at both stations. Assuming a well insulated line, there will then be no current on the line. But a current of, say, 50 milliamperes, to conform to Mr. Rhoads' figures, from the home and distant batteries magnetizes the respective polar relays at each station by current through the artificial line coils. Of course, we are dealing ultimately with the magnetizing effects on the cores of the relays. Assume that in Fig. 2 the pole changer at Y now opens, disconnecting the negative battery, and is in transit between contacts a definite length of time. During this time, according to Mr. Rhoads, the home battery and the stored energy of the line will be the only forces acting and that they are slight or negligible. It is, however, to be noted in Fig. 2 that when the distant pole changer is between contacts the negative current from battery at X, under the conditions now assumed, finds a momentary circuit to ground at Y through the polar relay coils and the artificial line. As this doubles the resistance of the main line from X, the current will be 25 milliamperes on the main line at this instant. This reduces the pre-existing magnetic effect in the home polar relay PR by one-half, while the magnetic effect in the distant polar relay PR' remains as before, inasmuch as the 25 milliamperes in each of its coils are magnetizing its core to the same polarity. Without the 25 milliamperes on the line at this instant the main line would still be at practically zero current. The next instant, as Mr. Rhoads further states, the distant pole changer makes contact with the positive pole, and the current on the line jumps from 25 milliamperes to 100 milliamperes in positive direction from Y (see Fig. 3). This is, however, not so important as it may seem, because the actual reversal at Y found

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a coinciding current of 25 milliamperes in the line which had reduced the magnetizing current in the home polar relay from 50 milliamperes to 25 milliamperes, this presumably speeding up the reversal in that instrument. On the other hand, when the distant pole changer is again opened and is between its contacts the conditions shown in Fig. 2 are reproduced, the previously existing 100 milliamperes on the main line are reduced to 25 milliamperes and not to zero, this retarding the reversal of the home polar relay which reversal is completed when the distant pole changer makes contact with its negative pole, reducing the main line current to zero.

Further investigation of the conditions on the circuit, with the home key open and closed, by means of diagrams akin to Figs. 1, 2, 3, and assuming as before appreciable current on the main line at the no contact moment of distant polar key, will, it is believed, show that in each case the retarded actions mentioned by Mr. Rhoads in the home polar relay will be speeded up, while the accelerated actions will be retarded.

Without saying that the said accelerating and retarding actions, here assumed to be due to an appreciable current on the main line at the no contact moment, may account for the uniform polar relay signals in duplex and quadruplex operation of former years, it is suggested in explanation of the light and heavy writing in the polar relay to which Mr. Rhoads refers and in which it is assumed that the No. 5 U coil is used, that when the distant pole changer is between contacts, that coil, by introducing at that instant its 1000 ohms inductive resistance, together with the 1200 ohms inductive resistance of the polar relay, may act as a choke coil, preventing or diminishing the actions described in connection with the figures just shown, and in which, as stated, the absence of No. 5 U coils is assumed. Granting the existence of current on main line at the moment when the distant pole changer is between contacts, at which time it is assumed that current from the home station flows through the coils of the distant relays in series, it seems evident that this current, in the absence of the No. 5 U coil, will perform in the quadruplex an important function in steadying the distant polar relay and in keeping the armature of the distant neutral relay forward against the pull of its retractile spring, at the no-contact instant in the distant pole changer, when the home transmitter is closed. It may be added that if the quadruplex transmitter is open at Y it will provide for the home battery at X a still shorter path to ground at Y through the "leak" of the field Key system, than is provided by the distant pole changer at the moment of no contact and perhaps with an improved result (In this relation it may be pointed out that the Haskins duplex, U. S. patent 154479-1874 utilized practically the principle shown in Fig. 2 in its operation, it having no battery at back contact of key, but using differentially wound relays and artificial line.)

In discussing at length the No. 5 U retardation coil in the bridge duplex and quadruplex, Mr. Rhoads refers to a traditional explanation of the operation of this circuit arrangement to the effect that because of the high impedance of that coil almost all the incoming current rushes into the

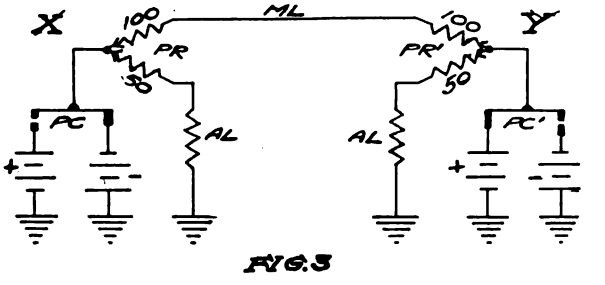

FIG. 3

bridge polar relay. The author does not think the explanation goes far enough and he then gives an interesting explanation by oscillograms and diagrams of the action at the home station of a certain iron wire quadruplex circuit, 140 miles in length, in which a No. 5 U coil is used. In my own work I have found that a diagram such as shown on page 205, "American Telegraphy," gives quite a clear insight into the operation of the duplex and quadruplex at any given instant, and if, in the said diagram, the Smith condenser is displaced by the bridge polar relay, also affords a ready means of ascertaining the voltage at, and the direction of current to and through the coils of the bridge polar relay, due to home and distant reversals.

It may not be amiss to note here that the selection of a single more or less favorable condition in the operation of the quadruplex, as in the cases discussed, only represents a minute fraction of the multifarious conditions that exist with the quadruplex in full operation and employing its 16 key combinations, to say nothing of the main and artificial line static currents. Imagine, for instance, what the various co-ordinations taking place in the circuits and apparatus must be while the distant and home pole changer and transmitters are being opened and closed and while the main line static and artificial line condenser are functioning. That the multifarious operations are carried out without a hitch in successful quadruplex telegraphy has always seemed marvelous to me. Nearly forty years ago it was written in a book, "The Quadruplex," "There are many such combinations continually occurring on the quadruplex which at first sight will seem to be enough to entirely prevent the working of the system, but, an analysis of each combination will prove, what is known to be the case, that they do not so prevent." I do not wonder, therefore, that Mr. Rhoads' remarks in his printed paper read at Cleveland in reference to oscillogram, No. 455 of Fig. 32, that it would be beyond expectation at first glance for the relays of a quadruplex to follow such apparently senseless waves. The experiments so far made, he adds, encourage the belief that it is not impossible, presumably referring to the burden

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imposed on the quadruplex by the No. 5 U coil, etc. Otherwise, and if the causes that impair the operation of the present day quadruplex are not removable, possibly owing to the great demands for wire facilities, the fault need not be paid to the quadruplex system, per se, for in the nature of things it has limitations. Yet in these days of carrier current telegraphy and telephony, it may be unwise to arrive at hasty conclusions as to those limitations.

(*To be continued*)

THE New York Central Lines superintendents of telegraph will hold their regular quarterly meeting at the Hotel Cleveland, Cleveland, Ohio, on Thursday, October 20th.

Valuable Information Instantly Available

E. A. Newman, manager of the Postal Telegraph Cable Company, Des Moines, Iowa, in renewing his subscription for two years writes: "Lately I have been putting in my spare time compiling and indexing the information I have been saving out of my copies of the AGE since 1915. I have a loose leaf binder, and will have a very good encyclopedia of telegraph material when I get through. I find following out the advise the "Observer" gave some years ago is the best training I can get. Am also studying the technical lessons you are running. I have these in a separate binder. Thought you would be interested in knowing how one of your subscribers is using your magazine."

Several subscribers to our paper state that their method of keeping track of important items is to clip them from the paper and place them in envelopes properly marked. As an example, all items pertaining to quadruplexes are placed in one envelope so marked. Other items of importance are placed in envelopes. Of course, each item carries the date of the issue from which it was clipped. The electrical industry is thus divided into about fifty subjects and each subject or department has an envelope. Supposing some data is required on the subject of printing telegraph systems. The envelope containing such clippings is instantly available and a history of printing telegraph systems is at once at hand for instantaneous use.

Another method of keeping track of important items appearing in publications is to have an index book, small in size, in which are recorded the items that may be of future use. The date of the paper or magazine and the page number is given so that the items can be looked up without much trouble. This system requires that the volumes of the publications be kept intact.

Practice makes all of the previously mentioned reference systems simple, and not one of our readers needs to depend upon others to supply them with information on any telegraph or telephone subject when he has in his own possession a history of each of the important subjects that go to make up the electrical industry, as we find it today.

Telephone Pioneers of America

The program of entertainment and the arrangements for the business session of the Telephone Pioneers of America at St. Louis on October 24th and 25th, has been completed by the committees in charge. The program for the first day, October 24th, is as follows:

10 to 11:30—Business meeting.

11:30 to 12:30—"Get acquainted" meeting with community singing and entertainment.

3 to 4—Loud speaker demonstration in Forest Park.

8:15—Entertainment at Statler Hotel by "home-folks."

On the next day, the 25th, the arrangements of the allotted time will be as follows:

11 to 12:30—Automobile trip through the city.

12:30 to 2:30—Luncheon at Sunset Hill Country Club.

2:30 to 4—Continuation of automobile trip.

7—Banquet.

Of all the attractions announced for the convention, the first and foremost is probably the demonstration of the Bell Loud Speaker, the device through which President Harding was enabled to deliver his inaugural speech to the listening ears of a crowd of 125,000 persons and which has been set up since then at various points where huge crowds of people have been assembled.

New Book

"Apparatus Telegraphic Installation," by E. Montoriol, Professor of the Principal School of Posts and Telegraphs, Paris, France, is the title of a new book just out. It is printed in the French language and contains 625 pages with 449 illustrations and measures six inches wide by nine inches in length. The book contains a description of all telegraph and cable apparatus used in France and in other countries. It is an encyclopedia of industrial electricity and is published under the direction of M. A. Blondel and Bailliere and Sons, Editors, 19 Rue Hautefeuille, Paris 6e, France. The price of this book is, paper cover, $8.00, and copies may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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PERSONAL

THOMAS E. FLEMING, of General Manager Carroll's office, New York, and secretary and treasurer of the Old Time Telegraphers' and Historical Association, has the sympathy of his friends in the death of his wife, Ellen E. Fleming, who passed away on September 30th after a long illness. Besides her husband, Mrs. Fleming is survived by two sons, W. E. and T. E., Jr., and one daughter, Marguerita, and two grandchildren, Paul and Helen. Prior to her illness four years ago, Mrs. Fleming was a frequent attendant at the reunions of Old Time Telegraphers' and Historical Association.

THOMAS S. BRICKHOUSE, in charge of the leased wire system of E. F. Hutton and Company, New York, has returned to his office after completing an extensive trip of inspection of his company's offices throughout the Western and Pacific Coast States.

J. O. CARR, manager, sales engineering department, Morkrum Company, Chicago, was a New York business visitor October 5th. Mr. Carr spent several days in New York before returning to Chicago.

POSTAL TELEGRAPH-CABLE COMPANY

EDWARD REYNOLDS, vice-president and general manager, is on a brief visit to Chicago and other important Western offices.

C. A. COMSTOCK, assistant to the general manager, is spending some time at Boston and other eastern division points.

WARREN S. HALLETT, superintendent of supplies, is taking a few days' rest and recreation.

RUFUS GOULD, of the plant department, is on an inspection trip in the eastern division.

J. T. WHITAKER, of the plant department, is inspecting motor vehicles in the southern division.

New York City

THE new office in the Barrett Building at Rector and West Streets was opened on September 15th. The office has been fitted up in strictly first class condition. Miss Virginia Shevlin is the manager in charge.

ARRANGEMENTS have been completed to open an office in the New Fisk Building at 57th Street and Broadway. It is hoped to have everything in readiness for the opening about October 20th.

MISS A. Prendergast, manager of the Hotel Claridge branch, is again back at her duties after an absence of two months. The position was temporarily filled by Mrs. M. Mills, who has since left the service to go West.

D. H. GAGE, division engineer, is visiting offices in New York State.

Managers Appointed

W. R. Gompf, Norwich, Conn.; J. P. Randall, Richmond, Ind.; R. W. Browne, Evansville, Ind.; G. R. Arrington, Durant, Okla.; C. N. Jones, Topeka, Kan.; R. Seabright, Ishpeming, Mich.; W. I. Hill, La Junta, Colo.; G. H. Savage, Lawrence, Kan.; Kirk Powell, Fulton, Ala.; R. K. Haskett, Cordova, Ala.; Ernest Weathers, Charlottesville, Va.; W. E. Petfield, Bethlehem, Pa.; A. P. Mellen, Alliance, Ohio; C. E. Nightingale, Salem, Ohio; J. B. Durand, Eau Claire, Wis.; M. A. Walsh, Herkimer, N. Y., and Howard Jolly, Gastonia, N. C.

Fall Dinner of the Magnetic Club

The date of the fall dinner of the Magnetic Club has been fixed for Saturday evening, October 29th. The dinner will be held in the north ballroom of the Hotel Astor. Considerable interest is being manifested in the occasion, and the committees are working with a view of making the dinner the most enjoyable in the history of the club.

At this dinner the winners of Class A banners in the Postal Telegraph-Cable Company's contest will be the guests of the company.

Boston

ALL NIGHT Chief Parmenter has been absent two weeks on account of illness.

OPERATOR Snider has returned from Fall River, being relieved by Operator Feeley.

MANAGER Regan of the Fall River office was in Boston on a visit recently. Mr. Regan has quite recovered from his recent illness.

QUAD Chief Burke has returned to duty, while Eastern Traffic Chief Farrar has gone to Maine to shoot. He will be away two weeks.

ARTHUR O'LEARY has returned to our ranks, having quit the brokerage service in favor of commercial work.

VICTOR LOWRY has been ordered to take a month's rest and he is spending it at his home in Ballard Vale.

MISS Rotch, one of our operators, has recently been given quite a write-up in one of the evening papers for her standing in the community as a high grade radio operator.

NEW arrivals—Messrs. O'Leary, Schwarts, Horsfall, Smith and Hicks.

DEPARTURES—Mrs. Stebbins, Mr. Curewitz and Mr. Thomas.

C. M. BAKER, general superintendent of plant, Postal Telegraph-Cable Company, Chicago, in renewing his subscription for another year, writes: "Were it not for this publication, I do not know how the telegraph fraternity would keep in touch with one another. The paper is a source of great interest to me."

Cable Connecting Italy and South America

Italy will in the near future have direct cable connection between that country and South America. The total cost of the enterprise will be about six million dollars. The new cable will start from Fiumicino (Rome) and will touch Spain, Brazil, Uruguay and Argentina, and eventually the Canaries and Cape Verde Islands.

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WESTERN UNION TELEGRAPH CO.

W. N. FASHBAUGH, vice-president in charge of traffic, who went to Denver some time ago on account of his health, is still in that city, but his condition has so much improved that it is thought that he will be able to return to New York the first of the year.

A. E. POWELL, cable general plant manager, New York, is making a trip of inspection of the company's cable stations in Canada and Newfoundland.

J. P. EDWARDS, division traffic superintendent, on October 11th left on a two weeks' business and pleasure trip. While absent, he will visit Chicago and Dallas, returning via Atlanta, Ga., his old home. Mr. Edwards never tires of referring to the State of Georgia as God's country. While in Dallas he will visit his son-in-law, J. F. Wilson, district commercial superintendent, where he will join Mrs. Edwards, who has been in the Texas city for some time past, visiting her daughter and two grandsons.

C. H. BRISTOL, formerly and for many years general superintendent of construction of the Western Union Telegraph Company, New York, now living in retirement in Florida, is a New York City visitor. Mr. Bristol is accompanied by Mrs. Bristol and is making his home at the Hotel St. George, Brooklyn, N. Y. He wll return to Florida about November 1st.

W. T. WHITE, superintendent of the North Sydney, N. S., cable station, was in New York for a few days recently enroute to Denver, Colo., on a visit to his son, who resides in that city.

THOMAS H. BROOKE, aged seventy-nine years, manager of the Western Union Telegraph office at El Reno, Okla., died on September 15th. Mr. Brooke was highly esteemed by a large circle of friends and acquaintances. In our June 1st, 1921, issue, we gave Mr. Brooke an extensive write-up. He was a military telegrapher during the Civil War and had been in the telegraph service sixty-two years.

Philadelphia

At the quarterly meeting of the executive committee of the Electrical Aid Society, held on September 27th, arrangements were completed for the Hallowe'en party, to be held October 29th, at Mercantile Hall. At this gathering, the first of its kind ever held by this society, it is expected the largest number of telegraphers ever before assembled at one time will be witnessed. Because of this fact, the committee has arranged for the placing of Morse sounders throughout the ball room. From a given point a key will be placed for the purpose of announcing by telegraph the events of the evening.

Recording Secretary Wm. E. Van Arsdall reports membership of the society as of September 27th to be 1,048, with total sick still being cared for as of same date, thirteen. Deaths to date number three.

A. G. STRICKLAND, chief testman of the American Telephone and Telegraph Company, upon his return from his vacation, found his desk covered with American Beauty roses, which are evidence of his popularity with those immediately under his direction. So much can be "said with flowers."

Boston

W. M. ISLES, assistant wire chief; H. E. Stickney, chief equipment man, and E. J. Corrigan, late night testing and regulating chief, have returned from vacations. The latter's position was taken care of by J. F. Madigan, early night testing and regulating chief, whose position in turn was covered by W. I. McFatter.

DURING the past summer, Portland superseded Boston as the relay office for the State of Maine. The installation of a two-channel multiplex from Portland to Boston and New York was mentioned in a recent issue of the AGE. Portland handled 149,000 messages over the multiplex routes in August, and 176,000 messages were handled by Morse.

THE sudden increase in file was well handled by Chief Operator Charles H. Stevens and his staff of Portland. Division Traffic Supervisor W. G. Wetmore of Boston also comes in for a large share of the honors, as do John Parks, automatic chief, and Charles Brogan, early night chief.

BOWLING activities started early in Boston this season. At least the early night force have arranged their schedule and opened the season during the first week in October.

THE Telegraphers' Mutual Aid Association held its regular quarterly meeting recently, when arrangements were made to hold a concert in the near future. President Smullen has appointed a committee to handle the affair, which will be held for the benefit of the Association.

The Most Sought After Electrical Book on the Market

"Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, offers the most complete study of the telegraph ever published. This standard text-book has been revised and brought up to date, and in addition to numerous diagrams and complete information covering the study of the telegraph, includes full descriptions of the newest apparatus adopted by the Western Union and Postal Telegraph companies, and describes the equipment of a modern telegraph office. This valuable book, with its 488 pages, 250 illustrations, and carrying an appendix of 24 pages and 16 illustrations covering the new Western Union Multiplex System, is the most sought after electrical book on the market. $2.50 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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Telegraph and Telephone Committee Meets in New York

The members of the Telegraphy and Telephony Committee, American Institute of Electrical Engineers, held a meeting at Institute headquarters, New York, on October 11th.

A tentative program was made up for the Institute current year, providing for the presentation and publication in the Institute *Journal* of a number of timely papers on subjects directly related to telegraphy, telephony and submarine cables.

It is expected that an entire session of the Midwinter Convention to be held in New York in January next will be assigned to that committee for the presentation of technical papers.

The following members attended the meeting of October 11th: Donald McNicol, New York, chairman; George A. Cellar, Philadelphia, Pa.; E. H. Colpitts, New York; H. Hulatt, Montreal; D. H. Gage and Stanley Rhoads, New York; Arthur Bessey Smith, Chicago; Frank A. Wolff, Washington, D. C.; L. W. Chubb was represented by F. D. Hallock; W. O. Pennell by C. A. Berry; L. F. Morehouse by R. D. Parker, and R. E. Chetwood by P. J. Howe.

There are now approximately 1,000 telegraph, telephone and radio engineers identified with the Institute.

Radio Corporation of America

PRESIDENT E. J. Nally is still in Paris.

C. P. BARTHOLOMEW, of Sydney, N. S. W., a director of the Amalgamated Wireless Australasia, Limited, was a recent New York visitor, enroute from London to Sydney.

MISS Ida Spilka of the sales division, New York, died October 4th of pneumonia.

GEORGE G. DESOUSA, treasurer, is enjoying his vacation at Atlantic City, N. J.

EDWARD J. SHEEHY and Carl C. Henderson, of the Broad Street office, were both married on October 7th, and sailed with their brides on the following day on the steamer *Fort Hamilton* for Bermuda.

All America Cables

C. E. CUMMINGS, formerly superintendent of the Mexican Division, has been appointed general representative in Mexico and Central America.

O. HECKSHER, formerly electrician in chief at Barranco, has been appointed general representative on the West Coast, with jurisdiction extending from San Jose, Guatemala, to Valparaiso.

J. B. SMITH, staff superintendent, arrived in New York on August 31st.

JOHN PASCHETAG is acting as manager of the Galveston office temporarily.

W. B. STEPHENS, manager at Valparaiso, arrived in New York October 10 for England on his way back to his station from furlough.

WILLIAM WISEMAN, formerly manager at Salina Cruz, and now on furlough, has been appointed chief inspector of landlines and office equipment, Mexican Division, with headquarters at Vera Cruz.

THE following appointments as managers have been confirmed: Morley Hurst at San Juan del Sur, Nicaragua; W. J. Butterfield, at Cartagena, Colombia, and F. H. P. Schrills, at Buenaventura, Colombia.

German Cable Deliveries

The Java newspapers announce the arrival at Bandoeng of Herr Engler, representative of the Norddeutsche Seekabel Werke, of Nordenham, in connection with the laying of new submarine cables in the Dutch East Indies. It appears that the Government of the Dutch East Indies has purchased about 2,900 kilometres of cable from this German company, which cable reached Priok at the beginning of August on the steamer *Flint,* together with a number of engineers, including Herr Gruno, the company's chief engineer. Dutch State engineers boarded the ship and were conveyed to the Dutch East Indies cable steamer, the *Telegraaf,* which took the cable on board for laying between Singkel and Sibolga, on Sumatra, and two new cables were to be laid between Java and Sumatra in the Soenda Strait and then from Makassar via Donggala to Menado and from Makassar to Socraboja.—*London Electrical Review.*

Associated Press Operators

The Associated Press employs about eight hundred telegraph operators. In one year approximately one hundred new employees, including vacation relief operators, are brought into the service. Vacation reliefs are given the preference in filling vacancies.

It is important that a good supply of operators be available to fill vacancies, as important to the operator in the small office as it is to the division officials who hire the men, for unless there is a good supply of operators some other method of delivering the report must be sought.

RADIO weather stations have been established at Rost, Norway, Iceland and Spitzenberger.

Obituary

JENNY A. OSGOOD, aged sixty-four years, for many years identified with the telegraph service in New England, died at Haverhill, Mass., on September 23rd.

WILLIAM A. AUSTIN, aged sixty-eight years, died at Providence, R. I., on September 21st. He was formerly a prominent telegrapher, but of late years he held the position of salesman in an outside business.

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Daily News and Concerts by Radio Telephone

The Westinghouse Electric & Manufacturing Company announces that it has opened a radio telephone broadcasting station at its plant in Newark, N. J., and, with the co-operation of the *Newark Sunday Call*, is supplying news and concerts which can be heard by wireless operators within a radius of 200 miles.

Every night, beginning at 8.05 p. m., an entertainment consisting of a digest of the day's news, Government reports, and a musical entertainment is given. A special feature of the entertainments is a children's hour every Friday night at 7 o'clock, when songs and stories for the youngsters will be radiophoned.

During the World's Series baseball games, every ball, strike and other play was reported as soon as made from this station, so that thousands were able to enjoy the games. Similar service will be provided for the major football games and other important events.

The Westinghouse Newark station operates on a wave length of 360 meters and its call letters are WJZ. It should be easily heard as far south as Baltimore and as far north as Albany; while under favorable conditions, the messages should be audible in practically the entire area east of the Mississippi River, and as far east as the Bermuda Islands.

———o———

What is a Russian Rouble Worth Now?

Recently newspapers in the United States commented on the necessity while traveling in Russia of substituting a freight car for the pocketbook in carrying Russian roubles from place to place. The Russian rouble previous to the war was worth about seventy-seven cents in United States money. It was the monetary unit of that country. Our readers can now judge what a rouble is worth by the following paragraph reprinted from the *Electrical Review* of London:

"TELEPHONE AND TELEGRAPH FEES.—As from August 1st the following charges were to be made for telephones and telegrams: A single subscriber has to pay 350,000 roubles a year, while a "collective" telephone—that is, one installed in a large house and used by a number of persons—costs 500,000 roubles a year. The fee for three minutes' conversation on a long-distance or suburban telephone has been raised from 1,800 to 7,200 roubles. The installation of a new apparatus costs 500,000 roubles. The persons or organizations who have the right to possess and use telephones on these conditions are those who previously were allowed to have the telephones free of charge. The charges for telegrams are as follows: Local telegrams, 100 roubles a word; inter-urban telegrams, 500 roubles; and urgent telegrams, 3,000 roubles."

"Watered Stock" Impossible

Stock issued by a utility company has nothing to do with rates under commission regulation.

Rates are based on the physical properties actually in use or capable of being used in the public service. Stock merely represents the ownership of individuals in the company and entitle these owners to participate, in proportion to their holdings, in the earnings of the property devoted to public use.

In the making of rate schedules a fair value is fixed on the physical property. It is then determined what the actual costs of operation are: *i. e.*, the costs of fuel, oil, materials, labor, taxes, maintenance, etc. This being known, an amount usually computed at six to ten per cent. is added by taking that proportion of the appraised value of the machinery, buildings and other equipment. This, together with an adequate depreciation charge, is the total amount the company is permitted to earn from the amount it may pay investors their "wage" for the use of their money, and establish credit such as will enable it to borrow continuously so it may build extensions as the public demands.

There is no such thing—can be no such thing—as so-called "watered stock" in a utility company under commission form of regulation. In the greater number of States the utility cannot issue securities in any form or in any amount without obtaining approval. Showing must be made that the money obtained is to be spent for actual physical property. Even were a utility to be "loaded to the guards" with stock issues in excess of proper capitalization, it would not have the slightest effect or bearing on the rates for service paid by the customer, as earnings of the utility company (as has been stated) are based upon the value of its property; the securities outstanding having nothing to do with the amount the utility is permitted to earn. —*Bell Telephone News.*

———o———

New Edition of Beginner's Manual of Submarine Cable Testing and Working, by G. M. Baines, Now Ready

Beginner's Manual of Submarine Cable Testing and Working, by G. M. Baines, has been thoroughly revised by its author and it was issued in fourth edition form on June 1st. The book is primarily for students in submarine telegraphy. All of the subjects on submarine telegraphy demanding attention have been brought within the scope of this volume, and have been dealt with, if not exhaustively at least at sufficient length to enable an intelligible idea to be obtained of them, which will admit of wider extension later. The book measures 5½ inches wide by 8½ inches long and contains 174 pages fully illustrated. The price of the work is $4.50 per copy, and it may be obtained at the office of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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Telegraph and Telephone Age

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CONTENTS

Inter-Office Trunking. By Harry E. Hershey of the Automatic Electric Company, Chicago. (Continued from page 462, October 16th Issue) 486

Wireless Telegraphy. By E. B. Pillsbury..... 489

Reunion of the Old Time Telegraphers' and Historical Association..... 492

Bernard E. Sunny, the Newly Elected President of the Old Time Telegraphers' and Historical Association..... 494

Student's Course in Technical Telegraphy. By Louis Casper. Lesson 38 495

All America Cables 497

Editorial—Spell Correctly. American Telephone and Telegraph Company's Report 498

The Railroad—Some Phases of Railroad Telegraph and Telephone Engineering. Discussion by Wm. Maver, Jr. (Concluded from page 480, October 16th Issue)..... 501

Personal. Postal Telegraph-Cable Company 504

New York Telegraphers' Aid Society 505

Western Union Telegraph Company..... 506

Radio Corporation of America 507

Canadian National Telegraphs. Death of George F. Milliken (the Inventor of the Milliken Repeater)..... 508

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Inter-Office Trunking

By Harry E. Hershey

Of the Automatic Electric Co., Chicago

(*Continued from page 462, October 16th Issue*)

In order to qualify for a first class switchman it is imperative that a man not only know the trunking in his own office, but must also be familiar with the general scheme of inter-office trunking used in the network of which his office forms a part. For obvious reasons it would not be ethical to give herein a complete trunking scheme as used by any operating company, therefore, the trunking shown in Figures 32 and 33 is not exactly as used in the Twin Cities, but still will serve to illustrate the principles of trunking.

By reference to Fig. 32 it will be seen that this network consists of fourteen offices. When an office is assigned a complete ten thousand lines it is spoken of as a main office, such as Center and Main in the figure. If the ten thousand lines are divided between two offices it is necessary to pass through one office when calling the other. The office that receives all the calls is spoken of as a main office, while the second office is spoken of as a branch office.

When calling from North to Spruce, or from Spruce to North, each office is considered as a branch out of the other. When calling from any other office both North and Spruce are considered as branch offices working out of fourth switching.

When calling from any office, Center is considered as a Main office.

When calling from Harriet to Calhoun the latter will be considered as a branch of the former. When calling from any office but Harriet, Calhoun is considered as a Main office. When calling from any other office Harriet is considered as a branch office working out of Calhoun.

When calling from Snelling to Grove, or from Grove to Snelling, each office is considered as a branch of the other. When calling from Spruce, North, Center, Calhoun or Harriet, both Grove and Snelling are considered as branch offices working out of 6th Switching. When calling from South, East, Main, Dale or Park, Grove is considered as a branch office working out of Snelling.

When calling from Spruce, North, Center, Calhoun, Harriet, Grove or Snelling, Dale is considered as a branch office working out of Park. When calling from South, East or Main, Park is considered as a branch office working out of Dale.

Main is considered as a Main office when calling from any office.

When calling from East to South, or from South to East, each office is considered as a branch out of the other. When calling from any other office both East and South are considered as branches working out of Main, although this is not apparent from Fig. 32.

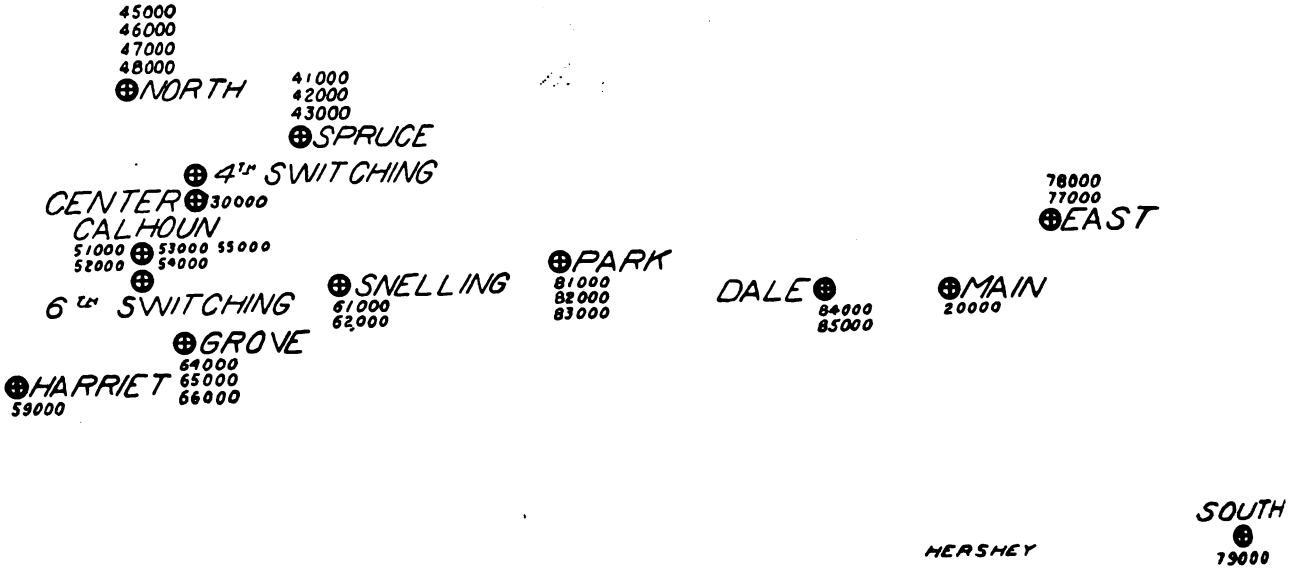

Fig. 32—Office Layout, Twin Cities

Switchboard Equipment

Across the top of Fig. 33 will be found the names of the various pieces of equipment; just below the name is the symbol indicating that particular switch. A large circle indicates a primary line switch and also a secondary line switch. A rectangle with ten banks below it represents a group of first selectors. Three small circles close together represent outgoing secondary line switches. A number of small rectangles, side by side, represent groups of repeaters. Second selectors, third selectors and fourth selectors are represented in the same manner as are first selectors. When the se-

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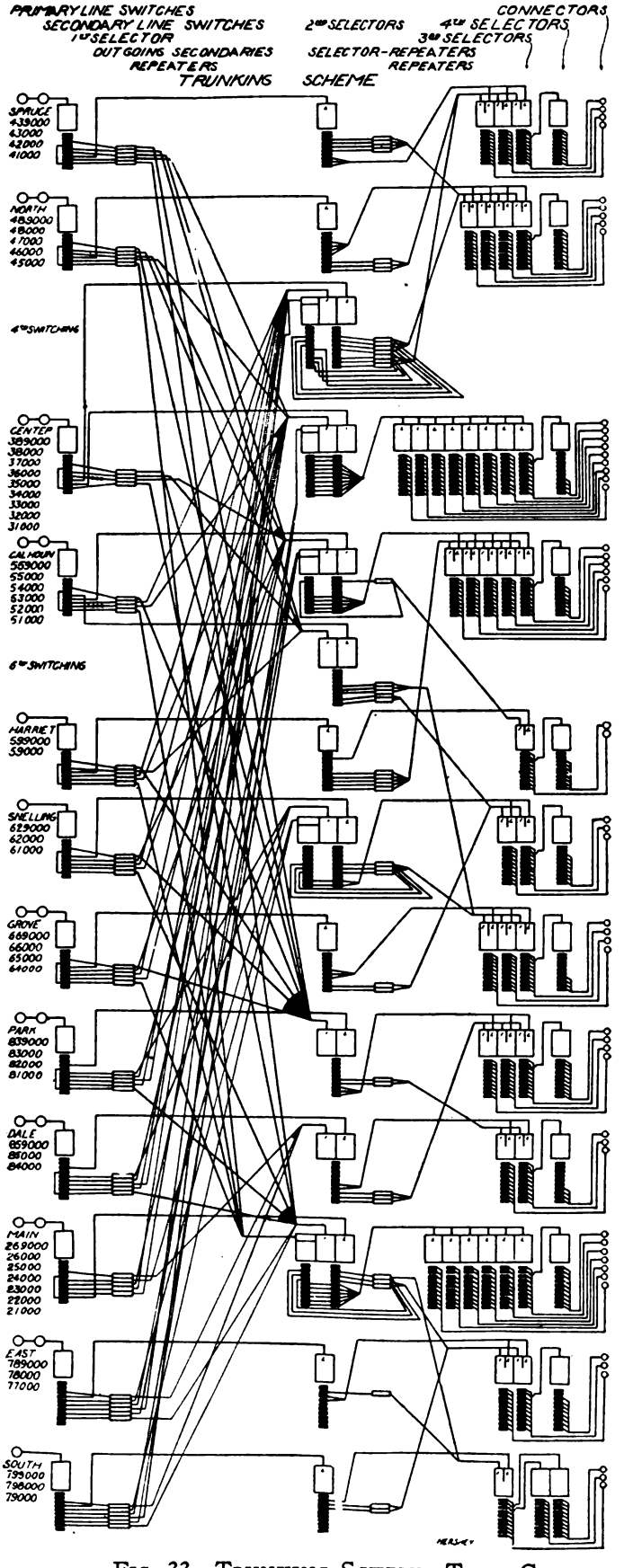

FIG. 33—TRUNKING SCHEME, TWIN CITIES

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lectors are terminals of incoming trunks they bear the letter I, when they are the terminals of local trunks they bear the letter L. Selector repeaters are indicated by the same figure as are selectors, except that the upper portion is divided into a secondary rectangle. The various groups of connectors are represented by small circles at the extreme right.

Location of Switches

Primary Line Switches will be found in all offices except 4th and 6th Switching.

Secondary Line Switches will be found in all offices except 4th and 6th Switching, Harriet, Snelling and South.

First Selectors will be found in all offices except 4th and 6th Switching.

Repeaters from First Selector Levels will be found in all offices except 4th and 6th Switching.

Incoming Second Selector Repeaters will be found only in 4th Switching, Center, Calhoun, Snelling and Main.

Local Second Selectors will be found in all offices.

Incoming Second Selectors will be found in all offices except Spruce, North, Harriet, Grove, East and South.

Repeaters from Second Selector Levels will be found in all offices except Center.

Incoming Third Selectors will be found in all offices except 4th and 6th Switching, Center and Main.

Local Third Selectors will be found in all offices except 4th and 6th Switching.

Fourth Selectors will be found in all offices except 4th and 6th Switching.

Connectors will be found in all offices except 4th and 6th Switching.

The Equipment in the Various Offices

Spruce. Primary line switches, secondary line switches and first selectors. The second and seventh level in the banks of the first selectors are multipled. The second, third, fifth, sixth and eighth levels go to corresponding groups of repeaters. The second group of repeaters are attached to trunks which terminate on incoming second selectors at Main. The third group of repeaters lead to incoming second selectors at Center. The fifth group of repeaters lead to incoming second selectors at Calhoun. The sixth group of repeaters lead to incoming second selectors at 6th switching. The eighth group of repeaters lead to incoming second selectors at Park. The fourth level in the banks of the first selectors lead to local second selectors. The first, second and third levels in the banks of the local second selectors lead to local third selectors. The fifth, sixth, seventh and eighth levels in the banks of the local second selectors lead to corresponding groups of repeaters, which are attached to trunks terminating on incoming third selectors at North. The banks of the incoming and local third selectors are multipled and lead to groups of connectors, with the exception of the ninth level in the last group, which leads to fourth selectors. The banks of the fourth selectors lead to the party line connectors.

North. Primary line switches, secondary line switches and first selectors. The second and seventh levels in the banks of the first selectors are multipled. The second; third, fifth, sixth and eighth levels in the banks of the first selectors lead to corresponding groups of repeaters. The second group of repeaters are attached to trunks which terminate on incoming second selector repeaters at Main. The third group of repeaters lead to incoming second selectors at Center. The fifth group of repeaters lead to incoming second selectors at Calhoun. The sixth group of repeaters lead to second selectors at 6th Switching. The eighth group of repeaters lead to incoming second selectors at Park. The fourth level in the banks of the first selectors lead to local second selectors. The first, second and third levels in the banks of the local second selectors lead to corresponding groups of repeaters, which are attached to trunks which terminate on incoming third selectors at Spruce. The fifth, sixth, seventh and eighth levels in the banks of the local second selectors lead to local third selectors. The banks of the incoming and local third selectors are multipled and lead to corresponding groups of connectors, with the exception of the ninth level in the last group, which leads to fourth selectors. The banks of the fourth selectors lead to the party line connectors.

Fourth Switching. The banks of the incoming and local second selectors are multipled, and the first, second, third, fifth, sixth, seventh and eighth levels lead to corresponding groups of repeaters. The first, second and third groups of repeaters are attached to trunks which terminate on incoming third selectors at Spruce. The fifth, sixth, seventh and eighth groups of repeaters lead to incoming third selectors at North. The first, second, third, fifth, sixth, seventh and eighth levels in the banks of the incoming second selector repeaters are connected to the corresponding groups of trunks between the repeaters and the incoming third selectors.

(To be continued)

Good Book on Telephony

Every telegraph man should have in his library a good book on the subject of Telephony. Kempster B. Miller's large work on the telephone has 904 pages and 304 illustrations. Containing, as it does, matter relating to all branches of telephony, this book constitutes a complete reference work of value to engineers and students.

The title of the book is "American Telephone Practice," and the price is $5.00 per copy. For sale by Telegraph and Telephone Age, 253 Broadway, New York. —Advertisement.

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Wireless Telegraphy

By E. B. PILLSBURY

The history of wireless telegraphy repeats once more the old story that is so often connected with great inventions. The world being possessed of a new scientific principle, many minds in many parts of the world are simultaneously bent upon its practical application, with the result that the fundamental principle finds embodiment in various methods of accomplishing a similar purpose. The startling nature of the discovery of electric waves was bound to give rise to unprecedented activity in the field of experimental investigation, and such experiments as were particularly successful encouraged investigators to seek patent protection on their modifications, and this, in turn, gave rise to several systems of radio-telegraphy.

A voluminous list of names could be given of those who have contributed to the advancement of radio-telegraphy in regard to both theory and practice. Among the best known American investigators are Fessenden, Shoemaker, De Forest, Clark, Stone, Alexanderson, Weagant and Massie. Each of these men has devised a system which bears his name. In England, the work has been carried on by men of such unqualified distinction as Lodge, Alexander Muirhead, Fleming, Thomson and Rutherford. Slaby, Arco and Braun are the names best known in Germany. The French are represented by Ducretet, Branly, Rochefort and Tissot, besides other men of lesser fame. Italy has contributed largely to the subject, principally through Marconi, Bellini, Tossi and Righi. Denmark is represented by Poulsen. Spain, Austria, Belgium and Argentina have all produced systems which have been more or less used in their respective countries. The Japanese have also devised a system that successfully stood the test of service in the Great War.

The development of the art in the various countries has been carried on largely by representative investigators, and in many instances the governments have adopted a system exploited by their subjects. The United States Government, however, has experimented with most of the prominent systems offered, and, as a result, the army and navy equipments are comprised of quite a variety of apparatus of different inventors.

Wireless telegraphy was the subject of earnest experimentation as early as 1838, but, as far as the public mind is concerned, the science began when Marconi sent his first message across the Atlantic from Cornwall to Newfoundland in 1902. This wonderful accomplishment had so much of the spectacular element in it that wireless telegraphy and Marconi became famous at once and, measured by results, Marconi has eclipsed all other wireless inventors.

Marconi first interested himself in the problem of wireless telegraphy in 1895. In the following year he took out the first patent ever granted in England for a practical system of wireless telegraphy by the use of electric waves. In 1897 he successfully communicated across Bristol Channel, a distance of nine miles. At the invitation of the Italian Government, Mr. Marconi subsequently went to Spezzia, where his system was put to practical test on board two Italian battleships. A station was erected on land, and the ships were kept in constant telegraphic communication with the shore up to a distance of twelve miles. Returning to England, he made further experiments and succeeded in communicating between Salisbury and Bath, a distance of thirty-four miles.

Mr. Marconi came to the United States in 1899, in connection with the America yacht cup race between Columbia and Shamrock I. In the same year a number of ships of the British navy were equipped with his apparatus. Early in 1901 telegraphic communication was established between two points more than 250 miles distant. In February, 1902, he received, on the board the steamer *Philadelphia,* in the presence of the ship's officers, good messages on a recording tape when at a distance of over 1,500 miles from the transmitting station. In December, 1902, he established a station at Cape Breton for transatlantic service, and maintained communication with the Cornwall station at Poldhu, transmitting inaugural messages to His Majesty the King of England and His Majesty the King of Italy, the *London Times* and others. A year later, during the voyage of the Royal Mail Steamer *Lucania,* Mr. Marconi maintained communication between the ship and the Marconi Station at Glace Bay, in Cape Breton, and Poldhu, in England, and a newspaper was published and issued daily to each passenger. A powerful station at Clifden, on the west coast of Ireland, was opened early in 1907, by means of which public communication across the Atlantic was established, which has been maintained ever since.

The importance of wireless equipment on seagoing vessels has been recognized by all nations, the United States law requiring two licensed operators on any ship carrying fifty or more persons and sailing between ports 200 or more miles apart. It is estimated that upwards of 15,000 ships are now equipped, and a large number of freighters carry wireless for their own protection, although not required to do so by law. In twenty years, wireless has placed to its credit the saving of thousands of lives and property valued at several millions of dollars. It is an inestimable boon to mankind that we can go to sea with the knowledge that we are kept in touch with home and can summon aid in case of disaster by means of the S. O. S. signal.

Out of shipwrecks in the last decade has grown a tradition that wireless operators may be depended on absolutely in times of peril. A grateful world remembers their services in connection with the *Republic,* the *Titanic,* the *Empress of Ireland,* the *Lusitania* and other ill-fated ships. They have amply demonstrated their high conception of duty and their readiness to respond to the call of humanity when the lives of others are at stake. In

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no case has an operator been found wanting in fidelity, courage and forgetfulness of self. The records of all operators who lose their lives in the endeavor to save others, as well as those who, without sacrificing their lives, are instrumental in saving life at sea, are perpetuated by the English Marconi Company on panels in Marconi House, in London. Near the sea wall in Battery Park, New York, stands a handsome granite shaft and fountain erected by popular subscription as a memorial to these brave men and faithful souls. It was conceived during the time when the world was recovering from the shock of the great tragedy of the *Titanic,* and stands today as a perpetuation of their great service.

Radio-telegraphy was a most potent factor for naval, military and airship use in the World War. On July 30, 1914, five days before the actual declaration of war, the English fleet, which had just left Portland, was recalled by wireless; and on August 4, 1914, Germany flung around the world on its chain of wireless stations this vital message to its mercantile marine: "War declared on England; make as quickly as you can for neutral port." This first despatch unquestionably saved Germany many millions of dollars of property and secured for possible future use a fleet of passenger and cargo boats which may yet play a great part in her recovery from war's ravages.

As long distance wireless rang up the curtain on the greatest war the world has yet witnessed, so it continued to play a great part therein. One of the most striking points in connection with wireless, which has been developed by the war, is that public attention has been directed upon it as never before, owing to the fact that so much of the official communications, particularly German information, has been brought to the notice of newspaper readers through this medium, owing to destruction of the German cables.

One of the objections made against wireless telegraphy is in regard to the possibility of interference between various stations and the confusion likely to arise when a number of stations are simultaneously operated in the vicinity of each other. Although this confusion does rarely arise in practice with proper up-to-date stations and apparatus, yet even with the old instruments, when it did occur, it was not by any means such a serious matter as generally appeared to the imagination of the public. In most countries the operation of wireless telegraph stations in regard to ship and shore communication is subject to judicious rules tending to prevent mutual interference. It is well known that without proper organization and discipline, serious difficulties due to interference would occur with the great majority of ordinary land wire telegraphs which work several offices by means of a single wire. In the case of wireless telegraphy it is often an advantage that any station should be able to pick up a message which may not be actually addressed to it, as for instance, in the case of a ship in distress calling for assistance. The most practical method of isolating any particular receiver so as to make it sensitive only to signals coming from a certain station lies in the principles of resonance; that is, to tune the sending and receiving circuits in exact correspondence.

When the war broke out a German company had high power stations in communication between Sayville, L. I., and Nauen, Prussia (3,262 miles), and between Tuckerton, N. J., and Eilvese, Prussia (3,383 miles). In order to protect our neutrality the American Government took over these stations and operated them in the interest of the owners.

The Government has erected a high power station at Arlington, within sight of the Capitol at Washington, with a radius of 3,000 miles under ordinary conditions. It represents the first step of the navy toward the establishment of a great chain of high power wireles stations which girdles the earth and brings the Navy Department into direct communication with the fleet throughout the length and breadth of the seas. Unless a war vessel be in the Arctic, Antarctic or Indian Oceans, it will be at all times within the range of one of the seven stations, the other six of which are located at San Diego, Honolulu, Manila, Guam, Panama and Samoa.

From the Arlington station messages can be sent to vessels stationed beyond the Azores to the western shores of Europe, to Madeira, Cape Verde, the mouth of the Amazon, Panama, the Galapagos Islands off the western coast of Ecuador, and Magdalena Bay. The radius also embraces through the chain San Francisco and the whole stretch of the California, Washington and Oregon coasts, the lonely wastes of Upper Canada, Hudson's Bay and the southern nose of Greenland, the entire Caribbean Sea, all of the West Indies, most of Peru, all of Colombia, Venezuela, the three Guianas and the watershed of the Amazon; and all of the United States, Mexico and the Central American republics are within the range of these stations. Weather reports and time signals and also information in regard to ice, obstructions to navigation, etc., are sent out broadcast for the information of navigators.

The success of Marconi in effecting transoceanic communication was a startling achievement. Regular message traffic has been transmitted between Europe and America continually for more than eight years over a duplex wireless circuit between Clifden and Glace Bay; that is to say, messages between these points are transmitted in either direction simultaneously. The transmitting and receiving apparatus of a station are not placed close together, but in separate stations a number of miles apart, connected by land wires, which make it possible to locate the sending and receiving operators in the same room. The receiving instruments and antennae, when properly arranged and adjusted, are not affected by outgoing signals from the nearby transmitting station.

The latest type of receiving apparatus greatly minimizes the interference to which wireless trans-

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mission over long distance was particularly exposed in the early days. The signals arriving from Europe are, as a rule, easily read through any ordinary electric atmospheric disturbances. This improvement in the received signals has, moreover, made possible the use of recording instruments, which not only give a fixed record of received messages, but are also capable of being operated at a much higher rate of speed than could ever be obtained by means of an operator reading by sound or sight. The gramophone has been used for receiving by inserting into it the wireless telephone, thus transferring the incoming signals to the wax record, which may be revolved at maximum speed and when filled removed to another gramophone speeded down to suit the capacity of the operator. This method is now being replaced by tape recorders. High speed in transmitting is attained by substitution of the Wheatstone Automatic Transmitter, using perforated paper tape, for hand transmission.

The Radio Corporation of America has taken the lead in wireless development on this continent and has for its president, Edward J. Nally, who needs no introduction to the readers of this journal. The company has established five high power stations on the Atlantic coast, two on the Pacific and two in Hawaii, and is exchanging a large volume of traffic with Great Britain, Germany, Scandinavia, France, Hawaii and Japan. It also has long range shore stations on both coasts for communicating with ships; the Cape Cod station being able to keep in touch with ships like the *Aquitania* when five days out of New York.

Ships are equipped and operators furnished by the Radio Corporation, which rents or sells the apparatus to the steamship companies. The apparatus requires frequent inspection and at times repairs or renewals. By retaining control over operators and equipment the Radio Corporation is enabled to maintain the equipment at the maximum of efficiency and insure satisfactory communication with other ships and with shore stations. This could not be accomplished were the ships permitted to select their own operators.

The International Radio Telegraphic Convention was concluded in London between all nations on the 5th of July, 1912, and the set of regulations then adopted for the guidance and control of wireless telegraphy is known as the London Convention. It regulates the organization and hours of service of stations, the form of messages, the charges, the routing, transmission and delivery of messages, the accounting, signaling of ships and stations, etc., etc., and has the backing of all governments, and must be adhered to strictly by employees of governments and commercial companies. With this convention as a basis of operation all over the world, disagreements and delays are reduced to a minimum, while the possible benefits of the science are greatly promoted.

Guglielmo Marconi was born at Bologna, April 25, 1874, being Irish on his mother's side. He was educated at Leghorn and Bologna University and first interested himself in wireless telegraphy in 1895. In the year following he went to England and took out the first patent ever granted for a practical system of wireless telegraphy by the use of electric waves, and his wonderful accomplishments since are universally known. His work has been recognized by many governments and seats of learning, he has been decorated by the King of Italy and made a life senator, and he has been decorated by the Emperor of Russia. He is an honorary doctor of many universities, including Oxford, Glasgow, Aberdeen, Liverpool and Pennsylvania, besides having received the freedom of the principal Italian cities. In 1909 he was accorded what is perhaps the highest distinction that can be obtained by any scientist, the Nobel Prize for Physics, and he holds many scientific awards granted by various societies and institutions. The King of England has bestowed on him the honorary Knighthood of the Grand Cross of the Victorian Order.

During the quarter of a century since Hertz made his famous discovery of electric waves, radio-telegraphy has made many substantial advances toward the goal of perfection and it stands today a conspicuous and brilliant example among the many resources which science has contributed to modern civilization.

New Edition of Beginner's Manual of Submarine Cable Testing and Working, by G. M. Baines, Now Ready

Beginner's Manual of Submarine Cable Testing and Working, by G. M. Baines, has been thoroughly revised by its author and it was issued in fourth edition form on June 1st. The book is primarily for students in submarine telegraphy. All of the subjects on submarine telegraphy demanding attention have been brought within the scope of this volume, and have been dealt with, if not exhaustively at least at sufficient length to enable an intelligible idea to be obtained of them, which will admit of wider extension later. The book measures 5½ inches wide by 8½ inches long and contains 174 pages fully illustrated. The price of the work is $4.50 per copy, and it may be obtained at the office of TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

Cable Map of the World

The International Bureau of Communications, located at Berne, Switzerland, has issued a map showing the cables of the world. The map measures 21 inches long by 25 inches wide. There are fifty-five submarine cables shown on the map. Copies can be obtained at 50 cents each from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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Reunion of the Old Time Telegraphers' and Historical Association

NEXT MEETING CHICAGO, ILLINOIS—B. E. SUNNY ELECTED PRESIDENT

The thirty-eighth annual reunion of The Old Time Telegraphers' and Historical Association was called to order at the Hotel Jefferson, Richmond, Va., at 11 a. m., Tuesday, October 18th, by General Jo Lane Stern, the president of the Association, who extended greetings to the delegates. Prayer was offered by Rev. Dr. F. T. McFaden, pastor of the First Presbyterian Church, of Richmond. Governor Westmoreland Davis in an eloquent address then extended a warm and generous welcome to the visitors in the name of the people of Virginia. Governor Davis' address was brimming over with the spirit of Virginia's hospitality and was received with prolonged applause. The Governor was followed by Hon. George Ainslie, mayor of Richmond, who in eloquent terms, tendered the freedom of the city to the visitors.

GENERAL JO LANE STERN

President, Old Time Telegraphers' and Historical Association

The response to the Governor and the Mayor was made by Thomas D. Lockwood of Boston, Mass., in glowing terms of appreciation.

An interesting feature of the meeting occurred at this point, when former President J. C. Barclay pinned upon the breast of President Stern the Morse daguerreotype presented to the Association for this purpose by the late James D. Reid.

The report of the secretary-treasurer, Thomas E. Fleming, was an interesting and gratifying document, showing that 317 new members were admitted during the year, the largest number received in any one year in the history of the Association. The total membership is now 1,171 and the balance in the treasury is $1,227.

The States reporting the largest gain in membership were New York, 87; Virginia, 50; New Jersey and Missouri, 18 each.

Reports of the auditor, F. J. Scherrer, and of the historian, J. B. Taltavall, were then read and received.

The secretary then read a very interesting report prepared by David Homer Bates, secretary and treasurer of the United States Military Telegraph Corps. The report states that only 101 members are now living, out of a total of 1,800, and because of diminished numbers it was impossible to muster more than a few members at an annual reunion. The average age of the members is over eighty years.

Resolutions of sympathy on the death of Charles W. Bradley, president, and Geo. W. Stevens, vice-president, both of whom died last winter, were adopted and ordered printed in the proceedings. As a mark of respect to their memories, the delegates remained standing while taps were sounded by a bugler from the John Marshall high school.

An amendment to the constitution reducing the age limit for eligibility for membership in the Association from twenty-five years in the service to twenty years, was adopted unanimously.

The report of the Committee on Place of Next meeting recommended the city of Chicago, and the report was unanimously adopted.

The Nominating Committee reported the following nominations: President, B. E. Sunny, president of the Illinois Telephone Company, Chicago; vice-presidents, R. C. Baker, Herbert Brown, E. W. Collins, A. W. Towsley and Chas. H. Shedd, all of Chicago. Auditor F. J. Scherer, Historian J. B. Taltavall and Secretary-Treasurer Thomas E. Fleming, New York, were re-elected.

Remarks were made by Walter C. Burton, commending the interest and industry of Secretary-Treasurer Thomas E. Fleming, which had much to do with the increase of 317 to the membership during the year.

The entertainment features began immediately after the adjournment of the business meeting on Thursday at one o'clock. A luncheon was served the entire party at the Jefferson Hotel. In the afternoon automobiles conveyed the delegates on a sightseeing trip throughout the city. Among other historical places visited was St. John's Church, erected in 1741, and in which the Virginia House of Burgesses held their meetings. It was from one of the pews of this church that Patrick Henry made

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his celebrated speech, concluding with the words, "Give me Liberty or Give me Death."

In the evening an entertainment was provided in the Jefferson Hotel auditorium. Songs were sung by "The Famous Colored Singers," and moving pictures, consisting of Gillette's "Secret Service" and several comical films were displayed.

At 9 a. m. Wednesday, a special train was taken for Fortress Monroe and Old Point Comfort, 84 miles distant. A stop was made at Williamsburg and the entire party had the pleasure of attending the exercises incident to the inauguration of the president of William and Mary College, which was founded in 1693 and from which several Presidents of the United States and many other famous men were graduated. President Harding and many members of his cabinet were present, and it was a rare treat to see and hear the President.

The journey to Fortress Monroe was then resumed. A fine box luncheon was served on the train. Arriving at the Fort, Government automobiles were in waiting and conveyed the party to all points of interest about the Fort. This was a very delightful feature of the day and awakened the patriotic interest of all. At 7 p. m. the party arrived back in Richmond, closing a day long to be remembered.

The unusual facilities extended to the party to view all the interesting features of the Fort were due to the courtesy of Colonel Mitchell, the commandant, whose kind consideration was much appreciated.

Thursday was a day of rest and quiet sight-seeing in preparation for the grand closing banquet in the evening. A visit was made to the Executive Mansion at eleven o'clock and a photograph of the party was taken in front of the Governor's house. In the afternoon another ride about the city was arranged by the committee.

The banquet was held in the auditorium of the Hotel Jefferson at seven o'clock in the evening, about 200 being present. President Jo Lane Stern acted as toastmaster. His introductions were witty and eloquent and contributed largely to the pleasure and success of the banquet. Much interest was created by the exhibition of a relay that was used by General Stern when he was a telegraph boy in the Confederate army.

After coffee had been served and cigars lighted, E. P. Griffith, chairman of the committee on permanent Morse records, was introduced, and had the pen copy made by David Homer Bates of Thomas A. Edison's permanent record made last year thrown on the screen, while the beautiful Morse sending of Mr. Edison, reproduced on a phonograph was heard distinctly all over the large auditorium.

The pen copy made by Col. E. C. Newton of Little Rock, Ark., of the permanent record made by Col. Robert C. Clowry on July 25, 1921, was thrown on the creen. After pictures of Col. Clowry, sending the message and of Col. Newton receiving it at Little Rock, Ark., had been shown, the firm, clean Morse sending of Col. Clowry issued from the phonograph. The fact that Col. Newton wore the gray and Col. Clowry the blue, together with the fine sentiment expressed in Col. Clowry's message, made a deep impression, and as the phonograph ticked off the conclusion of the message and Col. Clowry's signature, there was loud applause.

The first speaker was Judge Charles N. Fiedelson, of the editorial staff of the *Richmond Evening Dispatch*. Judge Fiedelson's address was thoughtful, patriotic, eloquent and inspiring and was much enjoyed. Walter C. Burton of Brooklyn, Thomas D. Lockwood of Boston, and John C. Barclay of Montclair were the other speakers.

Alvin W. Smith, a prominent business man, and G. Jeter Jones, vice-president of the Merchants National Bank, entertained those present with a very funny mind reading exhibition, which caused roars of laughter.

Resolutions of appreciation to the ladies of the committee on behalf of the visiting ladies were proposed by J. J. Ghegan of New York, and general resolutions of appreciation of Virginia's hospitality and the untiring work of the Committee of Arrangements were offered by J. A. Chapman of Philadelphia.

These resolutions were adopted with enthusiastic unanimity, and with the singing of "Auld Lang Syne" there came to a close one of the most enjoyable and most successful reunions ever held.

The well-known hospitality of Virginia was manifested from early Monday morning to the singing of "Auld Lang Syne" at midnight on Thursday. Special mention may be made of the activity of J. W. Crews, chairman of finance and entertainment committee; Miss Helen Stevens, chairman of the ladies' committee; G. Jeter Jones, vice-president of the Merchants National Bank, who was here, there and everywhere looking after the comfort of the guests.

Others deserving of special mention are: Messrs. E. P. Goodwin, W. J. Harahan, John Kerrbranch, W. G. Sale, M. T. Spicer, W. H. Stansell, J. S. C. Murphy, C. G. DeWeese and Nathan Simon.

General Jo Lane Stern was the real commander, foremost in all of the exercises. Notwithstanding that General Stern was an operator in the Confederate service, he was as active and enthusiastic as a high school boy.

Those present were:

Atlanta, Ga.—J. B. Faulkner, G. W. Ribble.
Baltimore, Md.—F. G. Adams, Chas. Selden, A. Stevens and wife.
Boston, Mass.—E. A. Smith, T. D. Lockwood.
Buffalo, N. Y.—John E. Jenkins and wife, J. G. McNerny and wife, Mrs. Sadie E. Nichols.
Bradley Beach, N. J.—Francis J. Weiss, wife and daughter.
Chicago, Ill.—David A. Carroll and wife, A. N. Hauter, J. F. Morgan.
Cleveland, Ohio—D. C. Moon and wife.
Columbus, Ohio—Otis H. Newell and wife, G. F. Ramsey and wife.
Clifton, N. J.—L. A. Austin and wife.

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Clifton Forge, Va.—J. H. Carlisle, J. H. Ford, E. L Stratton.
Columbia, S. C.—J. T. Gray.
Charlotte, N. C.—Chas. A. Wood, K. F. Stiles.
Detroit, Mich.—R. H. Dunphy.
Doswell, Va.—R. H. Wright and wife.
Elmira, N. Y.—J. H. Shearer.
Freeport, Pa.—H. L. Kiskadden.
Hinton, W. Va.—J. G. Germer and wife.
Jersey Shore, Pa.—H. W. Wedge.
Johnstown, Pa.—Peter Weitz and wife.
Jersey City, N. J.—E. P. Griffith and wife, W. F. Taylor and wife.
Montclair, N. J.—J. C. Barclay.
Morehead, Ky.—A. L. Miller and wife.
Morrisville, Pa.—E. Y. Morris and wife.
New York—Thos. E. Fleming, John R. Heidemark, Dr. M. S. Polak and wife, Walter C. Burton, J. B. Taltavall, B. S. Cumming, John J. Ghegan, F. R. Veale, G. E. Murphy, F. J. Scherrer and wife, Maxwell Green and wife, John Morrison, F. A. Stumm.
New Haven, Conn.—Hon. Chas. E. Graham.
Norfolk, Va.—F. H. Piedmont, wife and sister.
Newport News, Va.—T. A. Worthington.
Philadelphia, Pa.—Andrew J. Wallace, John A. Chapman, J. S. Calvert.
Pittsburgh, Pa.—John F. Amend, wife and two daughters, S. J. Armstrong, C. A. Anderson, L. Behner and wife, Miss Jane Collins and sister, Letitia Duncan, Miss Susan R. Haney, W. R. Smith and wife, John B. Stewart and wife, Mrs. J. M. Ferry and daughter.
Richmond, Va.—E. P. Goodwin and wife, R. T. Bibb, W. M. Bickers, Chas. E. Bolton and wife, Edward H. Buckley, E. M. Canada and wife, J. W. Crews and wife, C. G. Deweese and daughter, J. A. Gleason and wife, T. R. Gooch and wife, G. Jeter Jones and wife, E. W. Miner and daughter, Calvert A. Montgomery and sister, J. S. C. Murphy, Miss Frances Murphy, F. S. Rockwell and wife, M. T. Spicer, wife and daughter, W. H. Stansell and wife, General Jo Lane Stern, president, Cecil W. Stevens, G. O. Summers, T. C. Vaiden and wife, C. W. White and wife, Frank S. Woodson, wife and daughter; W. G. Sale, wife and daughter, W. J. Harahan, wife and daughter, J. B. Parrish and wife, Nathan Simon, G. W. Stevens, Jr., J. F. Leonard and wife, Miss Helen Stevens.
Roanoke, Va.—G. W. Jett, wife, and the Misses Ellen and Margaret Jett, Frank R. Terrell.
Springfield, Mass.—Joseph Mills.
Springdale, Pa.—Mrs. L. C. Adams.
Trenton, N. J.—W. R. Morris and wife.
Washington, D. C.—D. F. Brown, W. N. Jeffress, Mrs. Ela Zirkle Keyes.
Wilkinsburg, Pa.—S. G. Greary, wife and son, W. I. McQuown and wife.
Warren, Ohio—J. W. Holloway, Frank J. Jones and wife.

IN reply to a telegram from General Jo Lane Stern to B. E. Sunny of Chicago, notifying him of his election as president of the Association for the ensuing year, the following response was received:

"I thank the Annual Convention of the Old Time Telegraphers and Historical Association for the distinguished compliment paid me in electing me president for the next year. I appreciate the kindness more than I can express. I hope to have the pleasure and privilege of saying this again at closer range a year from now."

Almost every telegraph and telephone department of foreign governments subscribe for TELEGRAPH AND TELEPHONE AGE. Some subscribe for as many as twenty-five copies of the paper to meet their requirements.

Bernard E. Sunny, the Newly Elected President of the Old Time Telegraphers' and Historical Association

Bernard E. Sunny, who was elected president of the Old Time Telegraphers' and Historical Association at the Richmond, Va., reunion on October 18th, is one of the most prominent figures in electrical circles in Chicago and the United States. He is president of the Illinois Bell Telephone Company and Wisconsin Telephone Company. He has won his way to an honored and front rank in the business world by the impelling force of an intelligent mind and high personal character. Alive, energetic, painstaking, methodical, faithful, always a close student, his ability to obtain a comprehensive grasp of the subject in hand has ever been a distinguishing

BERNARD E. SUNNY, CHICAGO
PRESIDENT-ELECT OLD TIME TELEGRAPHERS' AND HISTORICAL ASSOCIATION

trait of the man throughout life. He was at one time western manager and vice-president of the General Electric Company, of Schenectady, N. Y. his business jurisdiction of these important interests extending over an area of twelve States, an empire in itself. This position he held for twenty years, the development of the man keeping pace with the growth of the business, which expanded enormously under his fostering care. Yet, while physically strong, he carries the heavy responsibilities imposed upon him, not as a burden, as would be felt by some, but easily rather, for he is possessed of an optimistic nature, is buoyant in thought and cheerful in disposition.

Mr. Sunny was born in Brooklyn, N. Y., in 1856. and began his business career in 1872, when but sixteen years of age, as a messenger in the employ of the Atlantic and Pacific Telegraph Company.

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later becoming an operator. He early showed his aptitude for matters electrical and made rapid progress in acquiring a knowledge of the business of the dots and dashes, becoming expert at the key. In 1875 he went to Chicago, there continuing in the employ of the telegraph company he had served in the East. A recognition of the inherent abilities of young Sunny, quickly made him a night manager of the office, a promotion that was soon followed by his being advanced to its head as manager.

The telephone, then in its infancy, attracted the attention of Mr. Sunny. He made it a profound study, and when in 1879 he was offered the superintendency of the Bell Telephone Company, he resigned from the telegraph to enter this new field of electrical transmission. In the subsequent merger of the Bell and Edison companies, thus forming the Chicago Telephone Company, Mr. Sunny continued to hold his superintendency. He remained identified with telephone interests until 1888, and was closely associated with the first successful efforts to operate telephone wires underground.

To such a man as Mr. Sunny, in whom business acumen and executive capacity of the first order was gaining recognition and whose expertness as an organizer of large interests was apparent, it is not strange that as an individual he should command notice and his services a premium. In 1888 Mr. Sunny became president of the Chicago Arc Light and Power Company, at that time considered one of the largest central stations in the country, a position he retained for two years.

His next change was to accept the western management, with headquarters at Chicago, of the Thomson-Houston Electric Company, and in this responsible post he remained for another two years, achieving much to advance the interests of that corporation in the western field. His final opportunity came, however, when the powerful organization known as the General Electric Company, was brought about through the merging of the Thomson-Houston, the Brush and the Edison General Electric Companies. Of this great combination, Mr. Sunny was called to manage its western interests. He continued in this position until called back into the telephone field in 1907, when he assumed the presidency of the Chicago Telephone Company, now the Illinois Bell Telephone Company.

Mr. Sunny has acquired an enviable reputation in Chicago and at other points as being a public-spirited citizen. He has found opportunity to bestow his time and attention to numerous civic duties that have demanded his care. He was president of the Board of Trustees of the Eastern Hospital at Kankakee, Ill., for four years, the largest institution of the kind west of New York; president of the Commercial Club, made up of Chicago's leading business men and the Civic Federation, an organization responsible for constructive work for civic advancement. He is also a director in several financial institutions.

Mr. Sunny's selection to head the Old Time Telegraphers' and Historical Association was natural, when it was determined to hold the reunion in 1922 at Chicago.

STUDENT'S COURSE IN TECHNICAL TELEGRAPHY

By Louis Casper

Lesson 38

Earth Return

In general telegraph practice, the earth is utilized as a conducting path for operating circuits, thus saving the extra cost of building and maintaining a second wire, together with the extra liability to faults which an additional line entails.

One of the essentials to the successful operation of high speed and quadruplex circuits is that of a good ground. Its location and method of connection should be such as to insure high conductivity. Theoretically at least, the earth return may be regarded as a perfect path having no resistance. When a wire is placed in the earth at both of its terminals, no matter how widely separated, the circuit is practically completed virtually as though both ends of the line were immediately connected together.

In cases such as circuits having individual grounds, or for lightning arrester, high potential protection or aerial cable grounds, it is not so important that the ground resistance should be absolutely negligible; a certain resistance is allowable as long as the ground connection is substantial and constant. With main offices, however, and especially those of the larger class, it is quite essential to provide a ground of practically negligible resistance value for all the circuits that operate in such offices.

According to the specifications of the telegraph companies the minimum allowable resistance for ground is given herewith:

Central office ground	—0.1 ohms
Small office and test stations	—5.0 ohms
Compensation transformer (used for neutralizing power induction on telegraphic circuits)	—5.0 ohms
Lightning arrester grounds (office and cable terminals	—15.0 ohms
High potential protection grounds-(different types)	—25.0 to 100.0 ohms
Aerial cable grounds	100.0 ohms

Ground connections are made with water pipe systems wherever available. Other means of establishing ground connections are driven pipes or rods or buried wires. These are known as "made grounds." The preferable location for made grounds is where the surrounding earth will usually be moist. Abundant vegetation as a rule indicates

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underlying moisture and favorable conditions for grounds. Where the soil is such that the surface water readily seeps away, the natural salts in the earth are dissolved and carried off, leaving the earth a relatively poor conducting medium at that particular location. For this reason, filled-in grounds, gravel or sandy soil, and in some cases a fresh water stream are not desirable for making ground connections.

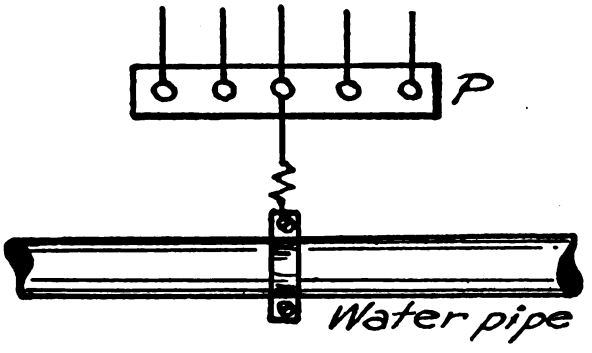

FIG. 106

The effect of a resistance of consequent value in a ground connection that is utilized by a number of circuits as an earth return, is readily observable on main line meters by the variability of incoming line current values. This is due to the inflow of current from one circuit to another on such wires as terminate at the same ground connection having such resistance. This is shown in Fig. 106, which illustrates a typical connection made with a water or gas pipe. In this diagram there are five wires connected to the ground Plate P. In each of these wires a current is flowing. If these various currents meet with resistance in their flow to earth a certain portion of the respective currents will seek other channels in accordance with Ohm's law. If, however, the ground connection is practically zero, such currents will flow directly to earth, and no portion of them will be diverted elsewhere. In such an event there would be no interference in current flow by the five wires that are connected to the ground Plate P, so far as the ground connection is concerned.

Earth Potentials

The great extension in the application of electricity to lighting, traction and power transmission at the present day, has led to the existence in many localities of large artificial earth currents which exert a disturbing influence on telegraphic operation, the efficiency of which depends, in a great measure, as stated, on a good non-interfering ground return. These artificial or "stray" currents are due in many instances to inefficient or entire lack of bonding of the rails which form the return path for electric traction currents. This may be further aggravated by the condition of the earth in the vicinity of such electric railways or of power lines, which are also a prolific cause for earth potentials. This is indicated in Fig. 107, in which a cross-section of earth strata is shown between stations A and B. At station A a stratum of good conducting earth is easily accessible and extends continuously and unbroken by interfering insulating medium to station C. The ground connection between A and C may therefore be considered satisfactory. At station B, however, the earth stratum is in a pocket formation and insulated, partially at least, from the good stratum.

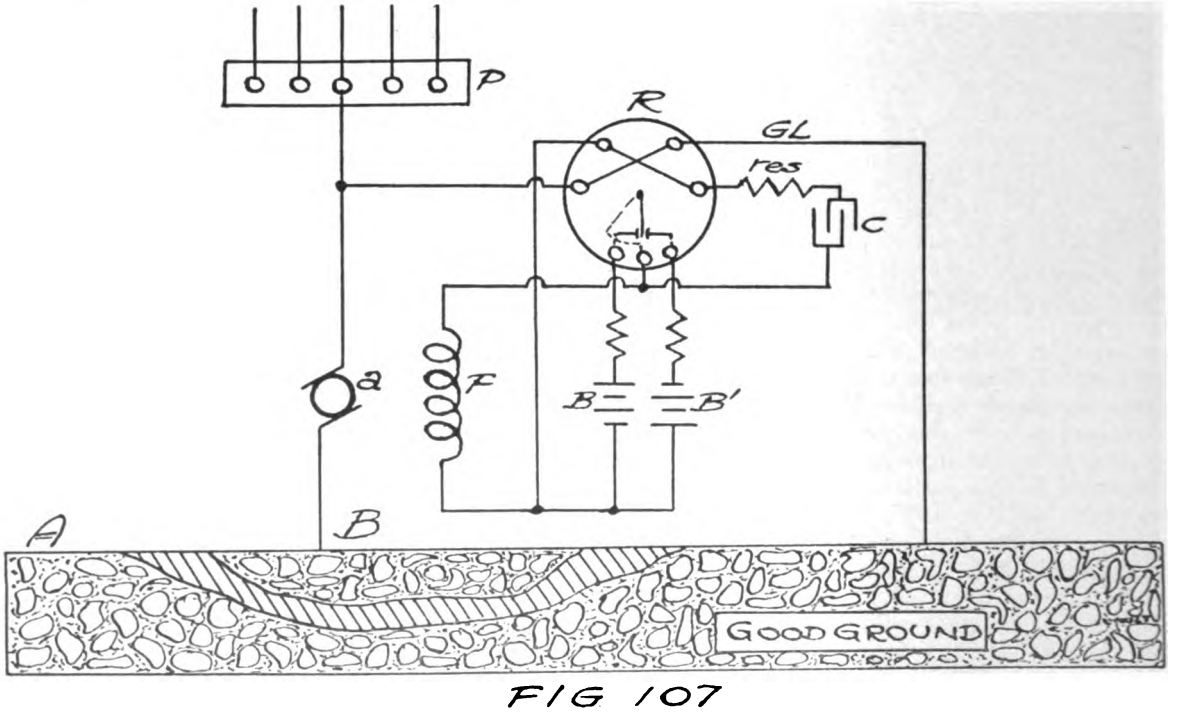

FIG 107

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The insulation between the two strata may consist of dry gravel or rock formation.

In localities where such or similar conditions exist, the stray currents from electric railways or power leads, through the earth, have but a limited area to flow in and are therefore apt to be very troublesome. If these artificial currents are fairly constant and the flow toward the central office ground is in one general direction, they may be neutralized by either "boosting" the motor generator potentials of opposite sign or by adding compensatory storage cells between the ground plate and earth connections. By this means the disturbing current may be reduced to negligible dimensions. If, however, the leakage current is of a variable character and the central office involved is an important one, other means must of necessity be employed to care for such irregularities.

A very practical arrangement, recently patented, is illustrative of schemes which seek to compensate for variable ground currents. This is explained by again referring to Fig. 107, which shows the arrangement in theory. A wire GL that extends, we will say, 20 miles distant to a point where a good earth may be obtained, is utilized and serves as a correcting medium through the operation of apparatus which will now be described.

R is a control relay, the main coils of which are connected at one terminal to the distant or good ground and to the ground place P at the opposite terminal. The ground plate P is connected to the variable earth through a lead having the generator armature "a" in series therewith. The differences of potential between the variable and good grounds cause the control relay armature to vibrate continuously and rapidly. This movement of the armature controls the current flow and polarity direction in the generator field coils F by the cutting in and out of either pole of batteries B, B', through the medium of the relay armature contacts. The generator field possesses considerable inertia due to self-induction, hence is slowly affected by the smaller variations of current, and only changes when there is a prolonged flow, which occurs when the relative contact periodicity of the control relay is longer on one side of the relay armature than on the other. This happens at a time when the armature "a" is not generating the proper voltage to neutralize the earth potential variation in the ground lead to which it is connected. The prolonged contact offers an opportunity for the arrangement to readjust itself. This action tends to neutralize whatever earth potentials may exist in the variable ground lead and thus maintains it at an approximate zero value.

The circuit that includes the control relay auxiliary coil, resistance R and condenser C, is intended to accelerate the action of the relay armature which in turn tends to a more positive and smoother operation.

Earth Currents

It is found that different parts of the earth are frequently at different potentials, and that consequently "earth currents" as they are termed, flow over the circuits between the various points.

There are times in the case of both land lines and long submarine cables when these currents attain such magnitudes as to render direct working impracticable. To overcome the "normal" earth currents of lesser magnitude which are frequently in evidence in submarine cable operation, bridging condensers and magnetic shunts are employed.

In land line operation during periods of "magnetic" storm, the only practicable remedy that appears to be effective up to the present time, is that of metallic operation.

The precise nature of earth currents is still a matter of speculation. They are always in evidence during magnetic storm periods, which have been attributable to sun spots.* When the Aurora, chiefly observable in the Arctic regions and the extreme east of Canada, is of a rapidly varying character, magnetic storm and earth current phenomena are generally found to coincide.

In this country the lines mostly affected during these "storm" periods run in a general direction from east to west. Lines operating from north to south are least affected.

(To be continued)

*In this connection the reader is referred to an excellent article in the October 16th issue of the Telegraph and Telephone Age entitled "Sun Spots and Magnetic Storms," by Arthur E. Cotterell.

All America Cables

On Wednesday evening at 8 p. m., November 2d, the first exhibition of "Linking the Three Americas," a one-reel film produced by the All America Cables, Inc., showing the technical operations in the sending and receiving of cable submarine messages, cable laying and other interesting features of cable service, will be given at the Auditorium in the Brooklyn Central Young Men's Christian Association.

W. B. Stevens, manager at Valparaiso, Chile, arrived in New York from furlough on October 10th and sailed on October 26th for his station.

W. S. Buchanan, the company's representative on the East Coast, has arrived at Buenos Aires, Arg., which city will be his headquarters.

C. E. Cummings has been appointed general representative for Mexico and Central America, with headquarters at Mexico City.

Otto Hecksher has been appointed general representative for the West Coast, with headquarters at Barranco, Peru.

Joseph R. Sheehan, identified with headquarters at New York, will leave on November 10th on a trip of inspection of all of the company's stations on the West and East Coast of the Central and South American countries. It will take him about six months to complete the work.

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EDITORIAL COMMENT

In the discussion by Wm. Maver, Jr., of Mr. Rhoads' able paper on telegraphy recently presented to the American Institute of Electrical Engineers and the Telegraph and Telephone Section of the American Railway Association, some points are brought out that will doubtless interest many of our readers. Thus in an explanation of the heavy and light signals in the polar relay which Mr. Rhoads gives as a result of his study of oscillograms showing the current conditions at the polar relay at the moment of no contact in the distant polechanger, he concludes that no current flows in the main line at that time. Mr. Maver does not controvert this view, but states that according to his experience with duplex and quadruplex telegraphy twenty-five or thirty years ago heavy and light signals in the polar relay did not exist. Mr. Maver, therefore, reasons that the unevenness of signals in that instrument to which Mr. Rhoads refers may be due to the introduction of high impedances in the main and artificial lines of present day quadruplex systems. Mr. Maver analyzes by means of ordinary diagrams the conditions that exist on the circuit in the absence of high impedances, between reversals of the distant polechanger, and finds that current does flow on the main line at that instant, which, he thinks, produces results that tend to explain the uniformity of signals in the early days of quadruplex telegraphy. The further study of these and analogous features of duplex and quadruplex telegraphy should prove interesting, and may develop valuable results.

Spell Correctly

MR. EDITOR:

It is not very often you have mispelled words in your splendid publication, and they look out of place in it. In reading the October 1st number I noticed two words a little off color, and perhaps it would be well to have the proof reader cautioned. I believe one of the words was in Mr. Selden's message to Mr. Edison, the word "benefited" had two t's. In one of the ads I think it was the word "consensus" spelled with two c's. This is the way they were spelled some years ago: "Benefited" "Consensus."

Yours,

"CJ."

Colorado Springs, Col., Oct. 7, 1921.

[C. J. is correct. The word benefited, if correctly spelled, ought to have but one "t." The word "consensus" which appeared in an advertisement, was printed according to the advertiser's wishes, and that is something over which we have no control. It occasionally happens that when our proofreader comes across a word such as "benefited" spelled with two t's and the forms are on the press, he prefers to let the word stand as it is, rather than make the correction and run the risk in so doing by making some other error more serious.

Some time ago, a writer informed us that he considered it a waste of valuable space to spell the word employee with two e's. That may be, but if employee with two e's is correctly spelled and it is so regarded by all authorities, we cannot change the conditions. We would prefer to follow old customs than endeavor to create new methods of spelling.]

American Telephone and Telegraph Company's Report

The business of the Bell System, says President H. B. Thayer, as a whole continues to show a healthy growth in spite of the fact that business in general has been comparatively quiet. There has been no abatement in the receipt of requests for telephone service, and notwithstanding the installation of new telephones at more than the normal rate, unfilled applications for service are still largely in excess of the normal amount. The net earnings of the Bell System show substantial improvement over last year.

The company on May 10, 1921, offered to its stockholders of record on May 20, 1921, shares of new stock for cash at par. Subscriptions amounting to $83,775,000 were received under this offer, thus putting the company in funds for profitable investment in extensions to the business.

It will be noted from the statement that the earnings of the American Telephone and Telegraph Company, which do not include the company's interest in the undivided earnings of the Associated Companies, show an increase for nine months of this year over the same months last year of $1,600,000 in the amount available for dividends. Approximately $4,000,000 more have been disbursed in dividends through the increased dividend rate and upon the larger capital, leaving undivided earnings for the period of more than $10,000,000.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
EARNINGS REPORT

	9 mos. ending Sept. 30, 1920	9 mos. ending Sept. 30, 1921
Earnings:		
Dividends	$26,079,475.82	$28,345,757.01
Interest	9,369,580.35	10,056,913.46
Telephone operating revenues	41,788,954.53	43,002,227.88
Misc. revenues	127,795.83	69,709.76
Total	$77,365,806.53	$81,474,608.11
Expenses, including provision for Federal and other taxes	24,056,229.35	25,921,776.13
Net earnings	$53,309,577.18	$55,552,831.98
Deduct interest	14,150,855.74	14,765,219.97
Balance	$39,158,721.44	$40,787,612.01
Deduct dividends	26,527,290.66	30,496,479.21
Balance	$12,631,430.78	$10,291,132.80

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The commercial purchaser can be guided with safety by the fact that after five years of experience with Kleinschmidt Printers, the largest Telegraph Companies continue to order them in quantity.

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MANUFACTURERS OF THE

GILL SELECTOR

THE UNIVERSAL SELECTOR
FOR
TELEGRAPH AND TELEPHONE

The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,
Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.
1205 Hobart Bldg., San Francisco, Cal.
2044 Railway Exchange Bldg., St. Louis, Missouri.

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THE RAILROAD

A MEETING of the Committee of Direction of the Telegraph and Telephone Section of the American Railway Association, W. H. Hall, chairman, will be held at 30 Vesey Street, New York, the headquarters of the American Railway Association, on Saturday, November 19th. Routine matters will be considered and disposed of at the meeting.

COMMITTEE No. 11, Construction and Maintenance, Inside Plant, has had its duties enlarged, and now includes the study of both telegraph and telephone transmission.

ACCORDING to newspaper reports, the impression prevails that the contract between the Western Union Telegraph Company and the Burlington Railway Company would not be renewed because the parties that issue could not agree upon a proper basis of settlement for a renewal of the contract. This statement is not correct. The contract has already been renewed, and the terms of agreement are satisfactory to all concerned.

H. HULATT, manager of telegraphs, Grand Trunk System, Montreal, was a New York visitor a few days ago.

C. S. RHOADS, superintendent of telegraph of the Big Four System, Indianapolis, has returned to his home from a trip to Florida.

New Japanese-America Cable

In order to improve the connection between Japan and America, a new submarine cable is to be laid. It was first intended that it should run from Yokohama via the Aleutian Isles to Vancouver and Seattle, but this scheme had to be abandoned owing to the ice risks.

THE San Francisco *Chronicle*, dated September 28th, states that five hundred telegraphers in the Chicago office have petitioned the employing interests to furnish their rest room with a talking machine. The paper adds that the telegraphers argue that if music will make hens lay more eggs and cows give more milk, it should also make keymen send more night letters.

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ALTERNATING CURRENT SELECTORS
(Controlling Patents)
Tested and Proved
Manufactured only by the
RAILWAY ELECTRIC MANUFACTURING CO.
250-252 West Water St. MILWAUKEE, WIS.

Some Phases of Railroad Telegraph and Telephone Engineering

(*Concluded from page 480, October 16th Issue*)

DISCUSSION BY WM. MAVER, JR.

On page 58 of his printed paper Mr. Rhoads states that from the evidence gathered in his investigations it is not apparent that the current in the polar relay changes at any greater rate in the set with the No. 5 U coil than in the one with the 500 ohm inductive resistance. On page 63 of his paper, also, he gives the results of his experiments as shown by oscillograms, of placing separate retardation coils in a quadruplex circuit, namely, that this had a marked detrimental effect on the operation of the quadruplex. It may be of interest to note that in both instances the oscillograms appear to bear out the present writer's experience and analyses as described in "American Telegraphy," page 563 b.

The author refers to the fluctuations in the line current due to the insertion and removal of resistance in the distant main battery of the quadruplex. Personally, I have always tried in writing on this subject, namely, the highly admirable Field Key system, to differentiate between the ordinary removal of resistance from a circuit and the variation of resistance in that Key system which produces a difference of potential at a desired point in the quadruplex circuit; the difference, I think, being important. Mr. Rhoads does well to emphasize, as he does, on page 60, the importance of keeping the protective resistance always at 600 ohms in the Field Key system.

Mr. Rhoads shows a neat device in which the usual Western Union Telegraph Company's holding relay is displaced by a separate neutral relay in the bridge wire of the quadruplex, the armature of which, when operated by currents from a bridged condenser is designed to open the repeating sounder circuit at the moment of no magnetism in the home neutral relay, due to distant reversals. Mr. Rhoads terms his device, probably for convenience, a holding relay. It is rather a local circuit opening device if it acts as intended. The present writer's extensive experience with devices of this kind is that it is difficult to insure exact co-ordination between them. In describing the operation of the Western Union holding relay, Mr. Rhoads states that the holding coil gives the armature a pull due to the condenser charging current that occurs with change of line current. Rather, the chief pull is probably due to the discharge current of the already charged bridging condenser, since I think it will be found that the bridging condenser is always charged before the distant reversal for a signal begins. This, if so, is fortunate, since in this very interesting operation the holding relay, getting the benefit of that discharge at an opportune moment, tends to hold the Western Union neutral relay armature forward against the pull of its retractile spring at the moment of distant reversal. Likewise, this discharge current of the condenser attracts the relay

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armature of the Rhoads device at an opportune time. This condenser current of discharge, however, probably weakens more rapidly than the previous magnetizing current in the coils of the home neutral relay, and when the moment of no magnetism in that relay arrives, at that instant, if not before, the zero moment also arrives in the holding condenser. Clearly, the retractile spring of the armature of the Western Union neutral relay and that of the Rhoads device will begin to act before the actual moment of no magnetism in the neutral relays and zero in the condenser arrives. At this time it is probable that the armature of the Western Union neutral relay and that of the Rhoads device fall back and rest on their back contacts for a brief instant, giving a tendency to a false signal, or split dots, in the reading sounder, which the repeating sounder should ordinarily prevent. The actual reversal current now begins, gradually magnetizing the line neutral relay. Simultaneously the holding condenser of the Western Union device begins to charge, setting up a current in the holding relay that tends to attract its armature, thereby perhaps giving back some of the energy taken by the holding condenser from the main or artificial line current. On the other hand, from the moment of no magnetism in the neutral relay and the zero moment in the condenser of the Rhoads device up to complete reversal seemingly no other function is performed. If its relay armature is fully attracted by the charging current of its condenser it may tend to open the local circuit which is then probably open also at the armature local contact of the line neutral relay.

A possible disadvantage of the use of devices of the foregoing nature is that when the short end of the distant battery is to line and when the tension on the retractile spring of the home neutral relay armature is weak, there may be a tendency, due to the charge and discharge current of the holding condenser, to open the repeating sounder contacts and thereby set up a chatter. All such points were carefully studied in connection with extraneous devices more than thirty years ago in quadruplex telegraphy. (See "American Telegraphy," page 207.) It is true, as Mr. Rhoads notes, that the extended lever arrangement of the neutral relay adds to the inertia of the apparatus. To my ear the signals received on circuits on which extended lever armatures on the neutral relay were employed had a pronounced drag as compared with those received on the short lever relays. It was axiomatic with the present writer not to add to the circuit or apparatus devices that did not show a wide margin of advantage. Consequently, in my own practice while electrical engineer of the Baltimore and Ohio Telegraph Company, 1884-1888, I recommended on the quadruplex circuits of that company the use of the Edison short core differential neutral relay without other devices than the Edison repeating sounder bug trap and with very successful results throughout. Thus the Boston-New York quadruplex circuits worked day in and day out like local circuits, while the second side of several New York-Chicago quadruplex circuits were leased for brokerage business, the exacting nature of which is well known. From personal experience, also, I may add that the Western Union Telegraph Company in the early days of quadruplex telegraphy, 1880-1884, did correspondingly well with their systems, in which they used only the short core relay, the Smith condenser arrangement and the Edison repeating relay. It is proper to say in this relation that on the quadruplex circuits then under my supervision there was no impedance in the lines except that due to the relays, and little or no interference from electric light and power circuits. There was, however, marked inductive effects from neighboring telegraph circuits.

In view of the great utility and wide employment of the combination of the extended lever of the neutral relay, in combination with the holding relay and bridging condenser, especially in commercial quadruplex telegraphy, it may not be out of place to state here, subject to correction, that the present writer was probably the first to suggest the use of this combination (see *Electrical World*, page 228, 1888), although he did not deem it necessary to employ it in his own practice, for reasons given previously herein, and it did not occur to him to attempt to patent the device before describing it.

Mr. Rhoads states that he employs the Edison repeating sounder bug trap with his device and that it functions perfectly. Such being the case, it might be suggested that the Edison repeating sounder be dispensed with, still keeping the neutral relay contact on the back stock, however. By so doing the inertia of an intermediate instrument will be dispensed with. It may be of further interest to try out dispensing with the repeating sounder since, in his paper the author adds that a critical examination of oscillograms Nos. 543 and 545 shows that the holding relay acts very slightly ahead of the neutral relay in the standard Western Union quadruplex. This result could be anticipated if the first action of that relay is due to the discharge current of the holding condenser and not to the current of charge. By dispensing with the repeating sounder the action would be speeded up to a certain extent and thereby perhaps meet the said advanced action of the holding relay.

Before leaving this feature of the paper it may be worth noting as showing what might indeed almost be expected, that Edison had also thought of utilizing the transit of a relay armature to prevent the false signal in the home neutral relay at the moment of distant reversal. Thus, in his U. S. patent No. 207724, 1878, Edison describes a local circuit opening device for this purpose, practically as follows: "The armature of the polarized relay which is in the circuit of the permanent retractile magnet (a substitute for the retractile spring of the neutral relay armature) being moved by reversals of

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current on the main line, opens the circuit of the retractile magnet momentarily and then closes the same, so as to neutralize as far as possible the risk of a false signal in the neutral relay armature by breaking the circuit of the retractile magnet at the instant of reversing the polarity of the distant battery."

It should be noted here that in a revised paper, Mr. Rhoads takes cognizance of the successful operation of quadruplex circuits in the past and the absence of the retardation coils, etc., in those circuits as the probable explanation. He also expresses surprise that such efficient quadruplex results were attained so long before the oscillograph was invented. In answer to this it may be remarked that the records will show that the telegraph engineers of over a quarter of a century ago did not consider that they were altogether in the dark as to what was taking place in the quadruplex, even without the aid of oscillograms. This is said without questioning the admitted value of the oscillograph. On the same page of his paper, Mr. Rhoads further remarks that "the investigations of the quadruplex and duplex indicate that it is the cumulative effect of little things which add up to an appreciable amount and prevent satisfactory operation. The battery taps must be equal in resistance, etc." On this point it may be urbanely remarked in passing that this conclusion would probably follow as a result of ordinary observation. At least, on page 233 of "American Telegraphy," the present writer, in 1890, wrote: "To insure the successful working of a quadruplex constant attention to details is essential. One radical defect in a quadruplex circuit may be readily traced and eliminated, but many trifling defects allowed gradually to accumulate, etc."

In other parts of his paper Mr. Rhoads discusses terminal resistance unbalance, telegraph transmission speeds, etc. In a paper presented some years ago to the American Institute of Electrical Engineers, by F. F. Fowle, entitled "Telegraph Transmission," these and other kindred subjects are treated at some length, and can I suggest be read to advantage in connection with Mr. Rhoads' paper by students of telegraphy.

It should have been stated that in the early days of quadruplex telegraphy in this country continuity preserving pole changers and transmitters were employed, and a single gravity battery was allotted to each circuit, before the advent of the dynamo machine. It is quite likely that the continuity preserving pole changer minimized the interval between reversals. Further, at this instant the gravity battery was short circuited and the main line was put to ground at distant station. In this case a current of 50 milliamperes from the home battery at X (see figures October 16th issue) would pass through the line coils of distant relays almost directly to ground, instead of 25 milliamperes as indicated in Fig. 2. (In this figure the arrow on main line at Y should be reversed.) This will cancel the 50 milliamperes flowing in the artificial coil of the home relay at X and leave that relay ready for reversal the moment contact is made with the distant positive battery, this speeding up the actual reversal in the home relay almost as if the delay between reversals of the distant battery were negligible. Further, after contact with distant positive pole has been made and when the distant continuity preserving polechanger is again short circuited in starting to place the negative pole to line, the previously existing 100 milliamperes on the main line is only reduced to 50 mlliamperes and not to zero, as assumed in the paper under discussion, at the moment of no contact in distant polechanger, this retarding the reversal of the home relay virtually until the actual reversal occurs at Y. The foregoing conditions assumed to occur in the operation of the continuity preserving polechanger, with home polechanger closed, and other conditions that follow with that polechanger open, appear to obviate still further the conditions which Mr. Rhoads, most likely properly assumes have produced the light and heavy writing in the home polar relay operated by the dynamo polechanger in the modern quadruplex system, to which he refers, namely that by delaying the start and accelerating the end of a marking signal when the home polechanger is open the signal is made shorter, which is the reverse of the conditions with the home polechanger closed. The analysis just made of the conditions assumed to prevail at the moment between reversals in the operation of the continuity preserving polechangers may also serve to further explain the uniformity of signals in the polar relay observed in the polar duplex and quadruplex systems of the eighties and early nineties of 1921.

In the section on Polar Relay Speed of Reversals, the author remarks that .investigation, presumably recent, shows that there is no noticeable effect on the polar relay due to variations of potential at the distant station. It may be noted that this fact was well known from the earliest days of the quadruplex. See "The Quadruplex," 1888, page 44, in which this feature is quite fully discussed. Under the caption "Single Morse," in Mr. Rhoads' paper, there is a section on 35-ohm relays in which it is recorded that a change from the 150 ohm main line Morse relay to 35 ohm relays on the New York Central lines has demonstrated that marked improvement in the service resulted. It may be of some interest to note here that the Association of Railroad Telegraph Superintendents had the matter of displacing 150 ohm Morse relays by 35 ohm relays. under discussion in 1896. At the convention of that Association in 1899, which the present writer had the pleasure of attending, a committee previously appointed to investigate the subject reported favorably at much length. A letter embodied in that report mentioned the case of a thirty year old iron wire circuit, 175 miles in length, with 30-150 ohm relays, measuring 7,500 ohms. The current was supplied by a dynamo of 160 volts at

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Omaha and gravity battery of 170 volts at Sioux City. In wet weather this circuit was inoperative unless when cut in two sections. The substitution of 37.5 ohm relays reduced the total resistance to 4,740 ohms, with the result that in the worst weather the entire circuit was successfully operated. In the discussion of the report many of the superintendents present reported successful results from more or less similar changes. The chief objection at that time to the reduction of line resistance was that it involved expenditure for increased current, then mainly supplied by gravity battery. The most marked improvement due to the use of 35-ohm relays noted by the train despatchers was that the character of the signals was changed from sluggish to sharp signals, a point also noted by Mr. Rhoads, page 36 of his paper.

In this relation it may be remarked that the effect of wet weather on poorly insulated wires, operated as single Morse circuits, in making it difficult to keep the relays adjusted, was very well known many years ago and the cause also was known. In 1890 or earlier, P. B. Delany invented a device termed by him a line adjuster, which under attainable condition automatically opened the line at both terminals, thereby opening all the relays on the circuit. The Delany device is described and illustrated in "American Telegraphy," p. 150. Apropos of this subject, reference may be made to the Stumm added resistance for use in wet weather on duplex and quadruplex railroad and commercial circuits. This device, it is well known, introduces at such times non-inductive resistance into the main line with remarkable improvement, apparently paradoxically, in the operation of the circuits. This improvement is perhaps due to the lessening of the variations of the line resistance caused by changes in the line resistance in stormy weather, thus steadying the adjustment of the system. It is understood that the Stumm resistance is now a part of the equipment of the Western Union rheostats used in duplex and quadruplex circuits, since it is also found to prevent undue heating. On the other hand, it is understood that the Postal Telegraph-Cable Company inserts resistance in the main line of such circuits in wet weather, by means of switch plugs carrying in their handles a desired resistance, plugs of varying resistance being nearby for use.

STEPHEN E. BARTON, of Boston, writes: "Do not fail to renew my subscription each year and send me the bill. Of the many publications that I take, there is none more welcome than yours, none that is read with more interest, although I have been out of the business since 1874. I used to see mention of the names of my old friends very frequently in the years gone by, but I regret that most of them have passed on and few are left of my vintage. As long as I live, and I intend to keep going the old gate for some time yet, I want the AGE to keep me linked up with the craft with which I was associated for so many years and in which I had many friends.

PERSONAL

P. B. DELANY, electrical engineer and inventor, who spent the summer at Nantucket, Mass., has returned to his home in South Orange, N. J., for the winter. Mr. Delany has been a prominent figure in telegraph and electrical circles for over fifty years.

POSTAL TELEGRAPH-CABLE COMPANY

EDWARD REYNOLDS, vice-president and general manager, has just returned from a tour of inspection which took him as far west as Minneapolis and St. Paul. In commenting on the business situation he gave it as his opinion that while business was inclined to be spotty in the Middle West there was a general improvement noticeable, and he is of the opinion that this improvement will be more apparent from now on.

GENERAL Superintendent E. W. Collins of Chicago, accompanied Mr. Reynolds on his trip through the Western Division, visiting all of the important offices.

THE Mackay Telegraph Cable Company enjoys the distinction of probably being the first telegraph company to expedite the delivery of messages by airplane. During the recent floods in Texas, telegrams were forwarded by airplane from Waco to Austin. L. E. Thiele, wire chief of the Dallas office, accompanied the airplane.

GENERAL Superintendent of Plant C. M. Baker, of Chicago, is visiting St. Louis and other points in Missouri on plant department matters.

MUCH enthusiasm was shown in anticipation of the dinner of the Magnetic Club, New York, on October 29th by all those who attended from the Western Division.

C. A. COMSTOCK, assistant to the general manager, has returned to New York, after spending some time in New England.

C. F. LEONARD, superintendent, New York, is making a tour through Connecticut, visiting the principal offices in that section.

R. GOULD, of the plant department, is on a trip of inspection through the Southern Division.

J. T. H. WHITAKER, of the plant department, is also on an inspection trip in connection with the company's motor vehicle equipment.

THE company has just completed an extensive installation of paired cable in its underground ducts at Cleveland, greatly extending its facilities for call circuit, pony wire and telephone extensions.

C. A. RICHARDSON, superintendent, Albany, N. Y., reports the following changes in his district: T. E. Quinn, appointed manager at Amsterdam, N. Y., vice H. A. Benjamin, resigned; L. J. Quinn, appointed operator at Amsterdam, N. Y.; C. A. Carson succeeds L. L. Fort as station lineman at Little Falls, N. Y.; L. A. Hanbury succeeds W. T. Lake as station lineman at Albany, N. Y.

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New York City

R. E. WALSH, western traffic chief, has returned from a two weeks' trip visiting relatives and friends in Massachusetts and Rhode Island.

A. AUSLANDER, western quadruplex chief, has returned from a two weeks' rest.

THE sympathy of the force is extended to Mrs. Matthews, of the service department, in the death of her daughter.

CHARLES H. MULLER has been appointed manager of the 621 Broadway office.

PREPARATIONS are being made to open a new office in the new Fisk Building, 1760 Broadway, which is one of the largest and finest office buildings in upper Broadway.

WILLIAM ANDERSON has been appointed chief operator of the 153 West 42nd Street office.

J. MESSENGER has been appointed manager of the 520 Hudson Street office in place of Mr. Anderson.

JEROME CONWAY has been assigned to the 356 East 138th Street office in place of Miss Gleason, who has been granted an indefinite leave of absence on account of poor health.

MISS Edith French, for a number of years the efficient delivery clerk at the Cotton Exchange, has resigned to be married.

MISS A. C. Hozier, of the Wool Exchange office, has returned to duty and assumed her position as manager, after an absence of several weeks due to illness.

H. KRONIGER has been transferred from the 621 Broadway office to the all-night trick at the 8 East 42nd Street office.

F. CANDITTO has been assigned as dock and steamship solicitor in place of J. H. Woodward, who recently retired from the telegraph service.

MISS C. Johansen is acting manager at the office in the McAlpin Hotel in place of Miss McCready.

Managers Appointed

H. E. McCarthy, Victor, N. Y.; Mrs. Ruth Ryon, Hendersonville, N. C.; R. W. Wilson, Alton, Ill.; W. A. Salmon, LaSalle, Ill.; A. R. Bates, Eaton, Ohio; Miss Pauline Hall, Charlottesville, Va.; J. W. Bruce, Niles, Ohio; C. S. Palmer, Fayetteville, N. C., and Leonard Anderson, Beardstown, Ill.

Philadelphia

DETAILED to Princeton, N. J., to assist Manager Dean in handling the big volume of press matter from the college football games were Messrs. Rodebaugh, Brailove, Rothstein, Gellman and Allen from the Philadelphia force.

THE sympathy of his associates is extended to Andrew J. Ellis, of the commercial department, in the recent sudden death of his wife.

MESSRS. Spindler, Gellman and Chamberlain were assigned to handle the press reports at the two days' meet of the Rose Tree Hunt Club.

ALL-NIGHT Chief F. K. Holtzinger is on the sick list.

G. LEE MUMFORD, of the plant department, has moved to the State of Matrimony and after having figured up many "ohms" of Cabletrouble, will now start on "ohm" of his own.

THE mother of General Wire Chief M. A. Baker recently suffered an attack of heart failure and died within a few hours.

Washington

JOSEPH G. TRUNNELL, chief operator of the Washington, D. C., office, entered the Postal service on September 14th, 1885, as messenger. He was made operator and branch manager in 1890, serving in that capacity until 1892, when he was transferred to the main office as operator, where his reputation for speed and accuracy culminated. He continued in this capacity until 1902, when he was promoted to the position of all night chief. Since then he has gone the rounds of repeater chief, wire chief, traffic chief, general traffic chief, until his appointment as chief operator January, 1920. His record is worthy of a few words of praise, for in the work which he has followed he has become an artist. A prodigy in the telegraphic field, a just man of unlimited patience and ambition fired by the desire to give the best that is in him. We all wish him continued success.

A SON was born to Charles S. Tebbs, our popular cashier, on October 19th, and that gentleman has our congratulations.

New York Telegraphers Aid Society

The New York Telegraphers' Aid Society will stage an entertainment and reception at Palm Garden, 58th Street, between Lexington and Third Avenues, on the evening of December 2nd. This affair will be the forty-first annual entertainment and reception of the Society for the benefit of the relief fund. Every member of the fraternity in New York and vicinity is urged to put his shoulder to the wheel and make this a banner occasion. The relief fund is for the benefit of employees in the telegraph service who are not eligible to membership in the Society. This fund is always drawn upon heavily to defray sick benefits and burial expenses. Every unfortunate member of the profession who dies in this vicinity is given a decent burial. The good that has been accomplished by the relief fund in the past thirty years cannot be over-estimated, and everyone who is familiar with the facts commends this worthy object. If any additional information is required, it can be obtained by addressing C. A. Kilfoyle, financial secretary, or Mary E. Saunders, recording secretary of the Association, 195 Broadway, New York.

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WESTERN UNION TELEGRAPH CO.

Earnings report for nine months ended September 30th, 1920 and 1921 (month of September, 1921, estimated), is as follows:

	1921	1920
Gross revenues, including dividends and interest...	$78,925,600.00	$91,544,687.00
Maintenance; repairs and reserved for depreciation	$13,677,100.00	$12,671,277.00
Other operating expenses, including rent of leased lines and taxes.....	57,910,130.00	67,329,523.00
Total expenses	$71,587,230.00	$80,000,800.00
Balance	$7,338,370.00	$11,543,887.00
Deduct interest on bonded debt	1,058,470.00	998,887.00
Net income	$6,279,900.00	$10,545,000.00

NEWCOMB CARLTON, president, sailed for England on the Steamer *Olympic* on October 15th. G. M. Yorke, vice-president, sailed on the steamer *Baltic* on October 22nd. Mr. Yorke will join Mr. Carlton at London on arrival and the two officials will be absent on business for about six weeks.

J. J. WELCH, general superintendent of traffic, New York, left the city on October 21st on an extended Western business trip that will take him as far as Denver.

GEORGE E. PALMER, circuit layout and routing engineer, has returned from a business trip to Chicago and Dallas.

EMORY H. FALLS, aged seventy-three, of Vice-President G. W. E. Atkins' office, died suddenly of heart disease on October 23rd. He was at his desk the day previously and apparently in good health. Mr. Falls was the oldest employee in point of service in the 195 Broadway office, he having come to New York when the headquarters of the company were removed from Rochester to this city in 1866.

Eastern Division

M. F. FORDHAM, manager at Montclair, N. J., has resigned to engage in mercantile business. Mr. Fordham is succeeded as manager by A. A. Nourie, formerly manager at Norwich, Conn.

CARL DONOVAN has been appointed manager at Norwich, Conn.

J. T. DORAN has been appointed manager at New London, Conn., vice C. L. Fichthorn, who resumes the position of chief operator at that office.

E. M. BAKER has been appointed manager at Greenwich, Conn., vice C. W. Coughlin, resigned.

THE office at Union Hill, N. J., has been removed from 418 Jefferson Street to 417 Union Street, and is being fitted up with new and modern equipment, which makes it a very attractive office.

ELIZABETH A. DUNN, operator, formerly of the General Operating Department, Buffalo, has been assigned to duty at Mount Vernon, N. Y.

G. B. LOZIER, of the traffic department, Buffalo, has been assigned to the commercial department at Lake Placid, N. Y.

NORMAN REINBOLD, of Liberty, N. Y., has been transferred to the managership at Lake George, N. Y.

Lake Division

RECENTLY, Messrs. Myers and Carpenter, of Vice-President J. C. Willever's office, New York, paid Chicago a visit.

CREDIT Manager H. W. Baker, of Chicago, has departed for eastern points to spend his vacation.

DISTRICT Commercial Managers F. W. Ford and Charles Griebenow, of Chicago, have exchanged places. The former takes over the westside district, and Mr. Griebenow assumes charge of the southside territory.

COMMERCIAL Agent J. A. Eck, of Chicago, has been assigned to the Philadelphia office temporarily.

THE Western Union booth at the Business Show, Chicago, which took place at the Coliseum last month, was quite attractive to the hundreds of business men who attended. Commercial Agent Maguire was in charge.

THE new office at Washington C. H., Ohio, was "cut over" on October 12th, and as promised, is one of the most modern and up-to-date offices in the district. Manager Leland is extremely proud of his new home and is being complimented on all sides on the distinctive acquisition to the business district of the town. The next in line is Portsmouth, where a new location has also been secured, and which will be ready for occupancy before the holiday season is on.

THE seasonal office at Cedar Point, Ohio, has been closed and Sandusky has resumed its normal activities, with everybody busy, in which the abundant grape crop makes up in part for the peach failure.

MANAGERS Appointed: Middletown, Ohio, E. F. Ramey, vice F. H. Smith; Bryan, Ohio, Robt. Worley, vice V. M. Edwards; Bellefontaine, O., Glen E. Bader, vice E. A. Krems, and Dennison, Ohio, E. W. Powell, vice E. F. Halter.

BUSINESS conditions would appear to be improving—at least in sections—as a number of offices in Ohio have shown an increase in revenues in September as against the same month last year.

MISS Minnie B. Totten, aged thirty-three years, of the bookkeeping department at Cincinnati, died on October 3rd.

GENERAL Manager A. C. Cronkhite, of Chicago, was a guest of City Superintendent Scholl, of Cincinnati, recently, the occasion being an inspection of the palatial new offices in the Dixie Terminal Building, which are about ready for occupancy.

THE Chicago Association of Commerce is staging a large civic pageant at Grant Park on the lake front, to celebrate the semi-centennial of the fire

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that made Chicago famous. In this a large number of industrial groups have been trained to have part in the separate episodes, Western Union group of two hundred employees putting on "The Great Fire."

Miss May Crowe, of the traffic department, and J. L. Wright have been chosen for speaking parts and Miss Dorothy Lewis of the general manager's office, holds the center of the stage for a few minutes. Miss Lewis' ability to sink her identity in the part she is playing has brought out special commendation from the pageant director, who thinks her fine sense of dramatic values of no small importance in the effectiveness of the scene.

J. F. Morgan, of General Manager Cronkhite's office, Chicago, was an attendant at the reunion of the Old Time Telegraphers at Richmond, Va. Mr. Morgan, through his years of association with railroad and telegraph officials, has perhaps as wide an acquaintance in the fraternity as any other man in the country, and he looked forward with considerable enthusiasm to the prospect of "reminiscing" with his old friends and associates.

Superintendents of Telegraph J. P. Church, of the Wabash; C. S. Rhoads of the Big Four, and G. H. Mayer of the Soo Lines, were recent visitors at Chicago headquarters.

W. J. Lloyd, retired general manager, now living in Denver, spent a day in Chicago recently visiting with his old friends. As soon as it had been noised about the building that "Billy" Lloyd was in town, he had a steady stream of visitors, who were disappointed at his short stay in the city.

J. B. Norcross, chief clerk to General Manager A. B. Cowan at Denver, with his wife, is spending his vacation in and around Chicago.

C. H. Murphy, of the time service division, New York, was a recent Chicago visitor.

Joseph P. Hayes, president of the Association of Western Union Employees, was re-elected for a third term at the General Assembly held in Detroit. Evidently the field has full confidence in Mr. Hayes' interest in their welfare, and his administration of Association affairs in general.

James G. Hayes was likewise returned for the third time. This is a tribute not only to his efficiency as general secretary-treasurer, but to his good-fellowship.

W. I. Lake, superintendent of the Chicago Western Union Building, is camping with friends among the lakes of Northern Wisconsin.

Frederick Thomas, aged sixty-eight years, an old timer, and one of the best known figures in the Chicago office, died while on a visit to his son at Crystal Lake, Illinois, on September 17th. Mr. Thomas was born in England and was educated at Dublin, Ireland, where he entered the telegraph and newspaper service. He came to the United States in 1881 as a Wheatstone expert and had been identified with the Western Union service since that time. Mr. Thomas was a student all his life, and languages were his diversion. Those who were his friends considered him to be one of the best informed men. His fund of knowledge on history and literature was practically illimitable. Mr. Thomas is survived by his wife.

A. H. Stirnaman has been appointed manager at Humboldt, Kansas, vice E. J. Stirnaman, who has been transferred to a similar position at Kennett, Missouri.

W. L. Adamson, district commercial manager, Kansas City, Mo., is spending his annual vacation visiting relatives at various points in Indiana and Chicago.

Robin W. Vaughan, aged fifty-three years, identified with the telegraph service at Los Angeles, died on October 10th. Mr. Vaughan had been employed by the Western Union Telegraph Company for the past thirty-three years, and had occupied many prominent positions. He was manager of the Houston, Texas, office, in 1902. He afterwards became chief operator of the Los Angeles office, which position he filled for several years, until 1912, when he was appointed manager of the Sherman, Texas, office. He later returned to Los Angeles for the same interests, where he remained until the time of his death. He is survived by his wife and daughter, as well as his mother.

Radio Corporation of America

President E. J. Nally is scheduled to sail from Europe for home on the steamer *Aquitania* on November 5th.

General Manager David Sarnoff, Traffic Manager W. A. Winterbottom and William Brown, attorney, have returned from a business trip to Washington. Mr. Sarnoff recently made an inspection trip in New England, which took him as far as Belfast, Me.

Chief Engineer E. F. W. Alexanderson sailed for Europe October 25th on the steamer *Aquitania*.

Additional floor space has been leased at 64 Broad Street, New York, and also at 326 Broadway, owing to the growth of the business.

Captain P. Page and Colonel C. H. Nance, of the Pan-American Wireless Telegraph and Telephone Company, Buenos Aires, Arg., have arrived in New York on business of the company.

G. J. Eshleman, engineer, has returned from Hawaii and taken up his new duties as engineer in charge at Tuckerton, N. J., Station. He was recently married.

G. L. Uffleman, engineer in charge of New York Radio Central, Rocky Point, L. I., has returned from his honeymoon, spent at his old home in Kansas.

General Superintendent A. A. Isbell, of the Pacific Division, is in New York on business of the company.

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THE engineering staff has arrived at New York Radio Central and final tests are being made in preparation for placing the new station in service. Eight number 9 copper wires connect the station with the Broad Street office, New York, four running direct and four via Riverhead station.

President Harding to Address the World by Wireless

President Harding will address practically all the peoples of the nations scattered throughout the civilized globe in one message, which will be broadcasted by radio on November 5th from the newest and largest wireless station in existence.

The arrangements were concluded on October 24th during a personal visit paid to the President by David Sarnoff, general manager of the Radio Corporation of America. The occasion will be the opening of New York Radio Central, situated near Port Jefferson, Long Island. It will be officially opened by the President, who will send his message from Washington over a land wire which will control the apparatus at Radio Central's station, and fling the words out through space over an area which includes all the important nations of the world. Immediately preceding the flash of America's greetings to the world via radio, the President will open the station by a special key placed on his desk at the White House.

President Harding showed special interest in the occasion because of the world-wide range of the station, which in testing has already been heard in all parts of Europe as well as in Australia, South America and Japan.

A distinguished assemblage will be invited to the ceremonies on Long Island at the station itself. Included in the list of those invited are many of the leading scientists of the world and industrial leaders, who will be given the opportunity to examine the most powerful radio station ever erected. The plant occupies a tract of land covering ten square miles, and with its ten units in full operation will furnish a combined transmitting energy of 2000 kilowatts, or ten times the electrical energy employed by the largest radio stations.

———o———

Canadian National Telegraphs

GEO. D. PERRY, vice-president and general manager, recently returned to Toronto, after an inspection tour to the Pacific Coast. Mr. Perry has great faith in the future success of the Canadian National Telegraphs, and its importance in developing the unlimited resources of the Dominion.

W. G. BARBER, general commercial superintendent, attended a recent conference of Western Union officials at St. John, N. B., where matters of commercial importance were discussed.

CHAS E. DAVIES, general traffic superintendent, and E. Kenward, superintendent of railway service, attended the fourth session, Telegraph and Telephone section, American Railway Association Convention, held in Cleveland recently.

GEORGE L. THOMPSON and Chas. C. Hamilton, former supervisors in the Toronto office, are now looking after the repeater and wire service at Hornepayne, Ontario. V. S. Lafayette, who took charge at the opening of the Hornepayne repeater station, has been relieving at Port Arthur, and will shortly return to his former trick at Capreol.

———o———

Death of George F. Milliken

THE INVENTOR OF THE MILLIKEN REPEATER

George F. Milliken, aged eighty-eight years, the well-known New England old time telegrapher and inventor, died at his home in Dorchester, Mass., on October 11th. Mr. Milliken was born at Portland, Maine, and there entered the service of the Maine Telegraph Company, in 1852. In 1853 he was transferred to the Boston office of the company. When the American Telegraph Company lines were extended to Boston, Mr. Milliken became chief operator and assistant manager of the main office. Until May 1, 1887, he retained the position with the American Telegraph Company and its successor, the Western Union Telegraph Company. At that time he resigned to enter other branches of the electrical business, with which he had been more or less identified until the time of his death. During his term of service with the Maine, American and Western Union companies, Mr. Milliken devised several improvements in telegraphic apparatus, among which may be mentioned the switch-board, embodying the principle of those used at the present day in all the large Western Union offices; the spring jack now in universal use by telegraph and telephone companies; the connecting bar for moving two or more switches and the repeater which bears his name; the last named device having been invented in 1862. He also originated and put into practical use, the signaling device by which the transmission of messages through a pneumatic tube, operates vibrating bells at each end of the tube, and which bells continue to ring until the door of the receptacle is opened for the removal of the messages, which action resets the trap.

It was Mr. Milliken who gave Thomas A. Edison his first position as a telegraph operator when the latter arrived in Boston. He was also of great assistance to Alexander Graham Bell in perfecting the Bell telephone. Mr. Milliken was also one of the inventors of the Gamewell fire alarm and had been associated with the Gamewell Fire Alarm Company in Boston until the time of his death.

Surviving him are his two daughters, Mrs. J. W. Moorcroft of Waltham, and Mrs. B. L. Jenness of Dorchester; also a son, F. L. Milliken, who resides in Milton, Mass., and is of the banking and brokerage firm of F. L. Milliken & Co., in State Street.

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CONTENTS

The Magnetic Club Dinner 510
Opening of "Radio Central" Marks New Era in World Communication. 512
New Publication—Circuits of Victory. War Memorial in the London Telegraph Office 514
Inter-Office Trunking. By Harry E. Hershey of the Automatic Electric Company, Chicago. (Continued from Page 488, November 1st Issue) 515
St. Louis Convention of the Telephone Pioneers of America. Association of Western Union Employees 518
General Methods of Signaling by Radio at Sea. The World Series Baseball Games 519
Student's Course in Technical Telegraphy. By Louis Casper. Lesson 39 520
Improving the Telegraph Service. By S. F. Weller, Chicago..... 521
Editorial—Institution of Post Office Electrical Engineers. The French Cable Co. and Wireless Interests. Telegraph and Telephone Life Insurance Association 522
The Railroad—Telegraph and Telephone Section of the American Railway Association. Death of E. A. Chenery 525
Some Phases of Railroad Telegraph and Telephone Engineering. By J. Brown, Beaver Dam, Ohio. Telephone Equipment Employed in Train Operation 526
Personal. Postal Telegraph-Cable Company 527
Edward Reynolds on the Business Outlook. Commercial Telegraphers' Union of America 528
Western Union Telegraph Company. Death of John F. Wallick. Radio Corporation of America 529
Canadian National Telegraphs. Obituary. Don't Advertise—Save Your Money 530
Entertainment of the New York Telegraphers' Aid Society. All America Cables 531
Another Western Union Telegraph Company. Appealing to Voters by Radio. Amateur Radio Operators of New York State Organized.. 532

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The Magnetic Club Dinner

The Magnetic Club of New York held its Fall dinner at the Hotel Astor Saturday evening, October 29th. It was, no doubt, the best dinner given by the club since its organization some thirty-five years ago, two hundred and sixty persons being present.

Many out of town officials were present as guests of the Postal Telegraph-Cable Company, including those who had been winners of a business-getting contest during the months of July and August.

Among the prize winners were not only men from the eastern part of the country, but from the South and the far West and the Pacific Coast. Chief operators from the more important centers and representatives of the plant and engineering departments from various parts of the country were also present as guests.

After coffee had been served, J. J. Whalen, president of the club, in an address welcomed the members and guests, taking occasion at the same time to compliment the good work done by the line and traffic departments in the restoration of circuits, and cited a number of individual cases of merit.

He then turned the meeting over to the toastmaster, W. C. Daviet, who, in calling on different speakers, injected considerable humor in his introductions.

The first speaker to be called upon was E. Reynolds, who took occasion to congratulate the winners and the guests, calling attention to the fact that through the success of Mrs. Watson of Paducah, Ky., the Magnetic Club was forced for the first time to throw open its functions to the ladies. During his talk Mr. Reynolds paid a personal tribute to Edward C. Platt, treasurer of the Mackay Companies, who was present at the dinner.

Mr. Reynolds was followed by Superintendent C. F. Leonard of New York, whose talk was in the nature of a welcome to the out of town guests.

J. F. Skirrow, chief engineer, next spoke of the exploits of the plant and engineering departments.

H. E. Patton, superintendent, Seattle, Wash., followed Mr. Skirrow in a beautifully descriptive talk of the attractions of the great Northwest, while also paying a tribute to the spirit of the Postal employees in that section of the country.

The last speaker was Judge William C. Fitts, who with eloquence and wit summarized the spirit of the company and the gathering.

During the evening messages were clicked off on sounders which had been placed around the room from General Superintendents E. W. Collins of Chicago, G. W. Ribble of Atlanta and A. B. Richards of San Francisco, and Superintendents S. H. Mudge of Kansas City, W. W. Morrison of Los Angeles, H. C. Shaw of San Francisco, and Jesse Hargrave of Dallas, and from Managers John Nering of Chicago and V. E. Blume of St. Louis.

After the conclusion of the speeches there was entertainment which lasted well on to midnight.

Those present were:

Atlanta, Ga.—J. C. Dolive, J. F. Heard.
Atlantic City, N. J.—J. E. Zecher.
Augusta, Ga.—E. B. Faust.
Albany, N. Y.—C. A. Richardson.
Birmingham, Ala.—W. C. Lloyd.
Baltimore, Md.—B. H. Lane, J. A. Vogt.
Buffalo, N. Y.—H. D. Reynolds, G. P. Wyckoff.
Binghamton, N. Y.—O. J. Smith.
Boston, Mass.—P. J. Macken.
Chicago, Ill.—M. Bachman, C. M. Baker, H. L. Heisler, T. N. Powers, W. L. Simpson, L. R. Thomas.
Cleveland, Ohio.—A. J. Black, Jos. Irwin.
Cairo, Ill.—Miss Feutz.
Charlotte, N. C.—J. A. Lindsay.
Charleston, W. Va.—H. H. Mull.
Cincinnati, Ohio—F. W. Sprong.
Detroit, Mich.—F. S. Eaton.
Dallas, Texas.—A. C. Hackler.
Fall River, Mass.—W. H. Reagan.
Fresno, Cal.—J. D. Tomlinson.
Grand Rapids, Mich.—G. G. Vetter.
Harrisburg, Pa.—C. E. Diehl.
Indianapolis, Ind.—J. F. Looney, F. W. Spooner.
Kansas City, Mo.—T. W. Ingram.
Little Rock, Ark.—C. M. Williams and wife.
Meridian, Miss.—L. F. Coxe.
Minneapolis, Minn.—A. S. Harris.
New Brunswick, N. J.—N. A. Aaron.
Narrowsburg, N. Y.—F. E. Riker.
New Orleans, La.—W. A. Sims.
New York.—P. Anello, A. Auslander, J. Bidell, F. J. Block, J. A. Brizzi, J. M. Barry, M. W. Blackmar, J. J. Barry, W. P. Brown, H. J. Casserly, R. S. Crosskill, J. F. Cleverdon, R. H. Casserly, P. T. Carl, C. A. Comstock and wife, T. J. Cassidy, M. T. Commiskey, A. Clarke, S. Cohen, J. J. Cochrane, M. P. Cohen, A. L. Cook, E. A. Coney, J. J. Cardona, F. Campbell, W. C. Daviet and wife, W. J. Deegan, J. A. Dupuis, J. J. Donohue, Wm. B. Dunn, F. H. Dennis, W. G. Ernst, J. J. Fitzgerald, Wm. C. Fitts, H. G. Funk, V. Fiore, I. Feldman, J. H. Flood, T. V. Flynn, W. Finlaw, J. L. Farrell, J. J. Fredericks, M. F. Geigle, P. J. Garvey, C. A. Gall, D. H. Gage, J. J. Griffin, J. F. Gibbons, J. J. Ghegan, W. C. Green, J. C. Gefvert, A. Goodman, G. Harth, W. S. Hallett, J. L. Harkins, T. J. Horan, J. D. Hanley, T. J. Holmes, F. Hennig, R. J. Hall, J. B. Havice, Walter Henshaw, J. Henry, E. B. Hagerty, D. J. Suriano, F. J. Kernan, Wm. L. Kearney, A. F. Kavanaugh, W. J. Kavanaugh, C. C. Koehler, A. P. Kranshaar, A. A. Kramer, I. Klutzman, J. J. Kane, C. P. Linder, E. Lippoth, E. J. Leahey, W. J. Lehmer, C. F. Leonard, A. M. Levenson, Thos. A. Murphy, L. A. Merrigan, J. J. McDermott, C. J. McCarthy, A. J. Motto, W. C. Michener, R. H. Miller, J. H. Mayer, M. A. McConnell, C. P. McInerney, J. A. McNulty, W. J. McNickle, E. McNally, A. Montuori, A. Maggio, T. Maguin, T. P. McGowan, F. E. McKiernan, D. F. Mallen, Harold Maloney, A. Minori, W. D. Morgan, A. McNeill, J. F. McNeill, W. J. Mitchell, C. H. Maurer, E. C. Michener, A. S. Nigrelli, F. F. Norton, J. T. Needham, C. J. O'Brien, C. W. Oram, S. E. Ostrom, J. P. O'Donohue, C. B. Obst, J. J. O'Rourke, Frank O'Keefe, W. J. Pallas, M. Pertka, F. G. Payne, F. Pearson, E. C. Platt, A. B. Parrish, J. Privitar, J. Russo, W. Redlefsen, L. T. Rogers, D. G. Rogers, C. R. Rimpo, E. J. Rankin, Edward Reynolds, F. Rauh, E. J. Rahtes, P. J. Rebecca, D. F. Regan, D. Shortall, G. Steenberg, N. Spinosa, W. V. Stahl, P. E. Sullivan, L. Schwartz, P. R. Shingler, D. Sullivan, J. F. Shugrue, J. Shandley, C. Shirley, C. Shirley, Jr., S. J. Stultz, H. L. Stern, Peter Solaski, W. Sweeney, J. F. Skirrow, H. Scrivens, Geo. Santulli, L. Starace, J. H. Stauffer, W. B. Schreiber, A. C. Teller, Robt. J. Tyrrell, E. P. Tully, E. Thornburgh, J. T. Tynan, J. B. Taltavall, T. H. Tierney, E. M. Underhill, H. F. Wyman, J. J. Wallace, J. P. Williams, A. J. Ward, R. E. Walsh, J. T. H. Whitaker, J. W. Weed, W. R.

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MAGNETIC CLUB DINNER, HOTEL ASTOR
OCTOBER 29TH, 1921

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Whalen, J. J. Whalen, F. J. Wilbur, H. E. Wilson, Chas. Yach, T. C. Zoebelein, J. Zingschmidt, Henry Zweifel, J. P. Williams, Jr., J. S. Ellis, C. A. Lane, Wm. Finley, H. Weiss, Wm. M. Wolff, J. J. Williams.

Omaha, Neb.—J. G. Wolf.

Philadelphia, Pa.—J. H. Wilson, C. E. Bagley, E. W. Miller.

Pittsburgh, Pa.—A. D. Wise.

Paducah, Ky.—Mrs. A. E. Watson.

Providence, R. I.—G. H. Mills.

Rochester, N. Y.—R. J. Little.

Redlands, Cal.—Hugh Mitchell.

Seattle, Wash.—H. E. Patton.

St. Paul, Minn.—G. H. Cassen and wife.

Washington, D. C.—T. P. Dowd, J. J. Minor.

Worcester, Mass.—P. S. Durgin.

Wheeling, W. Va.—F. H. Eakin.

Winston-Salem, N. C.—G. E. Leonard.

Wichita, Kan.—W. L. Meeks.

Utica, N. Y.—C. F. Lawlor.

Yakima, Wash.—Fred. E. Deir.

Yonkers, N. Y.—R. Donnon.

Chinese Telephone Directory

There are 1250 Chinese subscribers to telephone service in San Francisco.

Charles H. Dobson, division supervisor of directories for the Pacific Coast Division, has just issued what is said to be the only telephone directory in Chinese characters published in the United States. Some 2400 copies were printed, and a curious fact is that the directory is usually distributed on Sunday. It is contemplated to distribute these books to Chinese subscribers in the larger cities on the Pacific Coast.

The directory is printed from what is called the "offset process." Chinese characters are written on transfer paper, which is chemically treated with a gum substance. From this paper the characters are transferred to thin zinc plates. The gum substance, adhering to the zinc, reverses the listings. From these plates the listings are again transferred to transfer paper, and from this paper are again transferred to a thin zinc plate approximately 25 x 38 inches. The plate is then attached to a cylinder press and a thirty-two form is run.

Inside the book it is found that the listings are arranged alphabetically under the names of streets. The street having the largest number of subscribers is listed first. No alphabetical arrangement of street names is followed, as we are informed that the Chinese can remember street names better than they can the names of subscribers. Further, every Chinaman knows where the other fellow lives or has his place of business.

Chinese characters are usually read up and down the columns, but in the directory this arrangement is not followed, the listings being arranged as follows: first—telephone number; second—subscriber's name; third—classification of business; and fourth—address. The street name appears at the top of the list, so only the number of the street on which a subscriber is located is shown.

The book is an interesting example of co-operation between the company and the subscriber, and is being generally sought by the Chinese telephone users.

Opening of "Radio Central" Marks New Era in World Communication

History was made on Saturday, November 5th, when nearly four hundred people, representing governments, diplomatic, scientists, and captains of industry, not only of the United States, but many other countries, journeyed to Rocky Point, L. I., by special train to witness the opening of Radio Central, the world's largest and most powerful wireless station, designed and built by the Radio Corporation of America.

President Harding employed the big station for the first time by sending a message addressed to all nations of the civilized world. The message bears a timely and significant note in its appeal for world peace. It reads as follows:

"To be able to transmit a message by radio in the expectation that it may reach every radio station in the world is so marvelous a scientific and technical achievement as to justify special recognition. It affords peculiar gratification that such a message from the Chief Executive of the United States of America may be received in every land, from every sky, by people with whom our nation is at peace and amity. That this happy situation may ever continue and that the peace which blesses our own land may presently become the fortune of all lands and peoples is the earnest hope of the American nation."

The message was transmitted from the telegraph room adjoining the White House where President Harding pressed a key which closed a circuit, thereby starting into operation a Kleinschmidt Automatic transmitter upon which had been perforated a tape bearing the President's message. No sooner had the circuit been closed, than a special wire from Washington to Radio Central ticked off the dot and dashes of the message directly through Radio Central to all nations of the world. It took about five minutes to send the message, which was closely followed by all of the visitors present at the radio station. Shortly afterward messages began to be received from other countries answering the President's note. The first reply came from Norway, with Germany, England and France following shortly afterward. Then far-away Japan, which is 7,000 miles distant, and Sydney, New South Wales, 9,000 miles, were heard from, as well as Italy, Belgium, Sweden, Hawaii, and many other nations replied by cable and other means of communication. These countries were not fitted with transmitters powerful enough to reply by wireless.

The special train left the Pennsylvania Station at 9.30 a. m., and arrived at Port Jefferson at 11.30 a. m., where a luncheon was served to the guests.

Everyone regretted the absence in Europe of E. J. Nally, president of the company; also E. F. W. Alexanderson, chief engineer, who is also in Europe. Mr. Nally, however, sent a radiogram of greetings to O. D. Young, chairman of the board of the Radio Corporation of America.

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Brief addresses were made by General Manager David Sarnoff and Owen D. Young, the latter stating that: "If there is any thrill in this afternoon's performance, it is not because of the great technical achievement, but because America today is able to lay down to twenty-eight different countries this message from the President.

"Certain forces have been mobilized so that America might quickly develop the best radio communications in the world. Just as England, because of her geographical location, became the cable center of the world, so America, in this new art, is the center because every country desires direct communication with America."

Considerable literature in the shape of interesting illustrated booklets descriptive of the radio station were distributed to the guests on the train.

Among those present were such prominent men as E. W. Rice, Jr., president of the General Electric Company; Ralph Peters, president, Long Island Railroad Company; Owen D. Young, chairman of the board of the Radio Corporation of America; David Sarnoff, general manager of the same company; Gano Dunn, president of the J. G. White Engineering Corporation; Dr. Michael I. Pupin of the Columbia University; General George O. Squier, chief signal officer of the United States Army, Washington, D. C.; General Edgar Rusell of the United States Signal Service of the United States Army, Department of the East, New York; Dr. F. B. Jewett of the American Telephone and Telegraph Company; Ambassadors from Venezuela, Argentine, Chile, Brazil, and Poland; David Homer Bates, T. C. Martin, George H. Guy, C. H. Taylor, A. E. Reoch, Robert C. Edwards, W. P. Bowman, J. J. Ghegan, F. J. Scherrer, J. B. Taltavall, L. S. Wells, Donald McNicol. The Radio Corporation of America was represented by most all of its officials, including G. S. De Sousa, Lewis McConnach, W. A. Winterbottom, Lee Lemon, E. B. Pillsbury, Pierre Boucheron, Wm. P. Van Wyck, Captain P. Page, and many others

Radio Central—World's Greatest Station

The station is situated near Port Jefferson, L. I., the world's largest and most powerful station, designed and built for international wireless telegraph communication, by the combined engineering skill of the Radio Corporation of America, the General Electric Company, and other specialists.

With the opening of Radio Central, New York becomes the focal point of world-wide wireless communication.

Radio central station is designed for world-wide wireless communication, which includes Europe, South America and the Far East. This superstation is situated at Rocky Point (seven miles east of Port Jefferson) on the northern shore of Long Island, seventy miles from New York City. The station site covers 6,400 acres, or 10 square miles. The construction of Radio Central began July, 1920, and the first test signals were sent in October, 1921, or a little more than a year; a record in itself, when one considers the great amount of work accomplished. 1,800 tons of structural steel were used to erect the first twelve towers, each tower employing approximately 150 tons. Each tower is 410 feet in overall height and the cross arm or bridge supporting the antenna wires at the top is 150 feet long. 8,200 tons of concrete were employed for the foundations of twelve towers, the base of each tower leg being sunk nine feet below the ground, with a total base area of 360 square feet.

The distance between two adjacent towers is 1,250 feet, or nearly three miles, from the first to the twelfth tower. Each antenna consists of sixteen silicon bronze cables 3/8 inch in diameter stretched horizontally from tower to tower. In all, fifty miles of this cable has been used for the first two antenna systems. The ground system for both anenna consist of 450 miles of copper wire buried in the ground of the entire antenna system in starfish and grid iron fashion. The first power house section covers a space of 130 feet by 60 feet, and accommodates two 200 K.W. high frequency transmitting alternators with auxiliaries and equipment. A sending speed of 100 words per minute is at present possible with the use of each transmitting unit at Radio Central. This means a combined sending capacity of 200 words per minute for the two completed units. The erection of additional antenna units forming the spokes of the huge wheel and further improvements, which are being made, will correspondingly increase the transmitting capacity of the big station.

The transmitting range of Radio Central is practically world wide, as demonstrated by preliminary tests when the station was heard in all parts of Europe, as well as Australia, South America and Japan. The cooling pond for cooling the water after it has circulated through the high speed alternators covers a ground space of 64 feet by 42 feet, and is 7 feet deep. The pond is equipped with four spray heads which, when operating, present a beautiful and ornamental appearance. The community house for the staff is a low one-story building closely resembling an exclusive country club. It contains sixteen single rooms, an official suite, a large living room and dining room as well as quarters for servants. The engineer in charge, with a staff of fifteen assistants, comprises the personnel necessary to maintain the huge station in operation at present. The manufacture and installation of the high frequency alternators and their auxiliaries, switchboards, tuning coils, etc., were accomplished by the General Electric Company. The construction contract for Radio Central was executed by the J. G. White Engineering Corporation of New York, under the direction of the engineers of the Radio Corporation of America. The 23,000-volt transmission line was built from Port Jefferson to the station, a distance of seven miles, by the Long Island Lighting Company; the electrical power being generated at that company's Northport plant. There are no

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radio operators at Radio Central; the actual transmission taking place by remote control from the Central Traffic Office at 64 Broad Street, New York City. The receiving station working in conjunction with Radio Central, is located at Riverhead, L. I., sixteen miles away. No operators are located here, for the distant signals are first received by radio, automatically transferred to wire lines and received at audible tones at the Central Traffic Office, New York City. The action is simultaneous from the time the signals are transmitted abroad, picked up by the aerial, to the moment of actual transcribing by the receiving operators in New York.

The final installation at Radio Central will comprise twelve antenna units supported by 72 towers, forming, so to speak, the spokes of a giant wheel nearly three miles in diameter. Ten high frequency alternators will be employed which in total will give a power output of 2,000 kilowatts, or 2,700 horsepower. The electrical force thus brought into play at Radio Central permits the realization of the vision of communication engineers to transmit messages to all points of the world from a single centrally located source. The accomplishment of the Radio Corporation of America has been made possible through the financial, commercial, technical, engineering and research support of the following organizations: General Electric Company, American Telephone and Telegraph Company, Western Electric Company, United Fruit Company, Westinghouse Electrical and Manufacturing Company, and the Radio Corporation of America.

New Publication—Circuits of Victory

Hanging in thousands of telephone offices throughout the United States is a framed copy of the War Department's citation of the Bell Telephone System.

Among the expressions used in this treasured document are "splendid personnel," "loyal support," "technical ability," "superb qualities," "phenomenal results" and "efficient and satisfactory manner in which it assisted in providing and maintaining the communication service at home."

No man or woman in the Bell System has more than an inkling of the details of war service that brought forth such an official testimonial. Many thousand employees who, on a furlough basis, wore the service uniform at home and abroad, had the opportunity to comprehend more than a few of the plans, problems and achievements of those who engineered, built and operated the systems of communications made necessary by the war emergency

That is why every member of the Bell family will want to own and read "Circuits of Victory," by Captain A. Lincoln Lavine, just published by Doubleday, Page & Company.

As its alluring title suggests, it is a history of the World War from the standpoint of communications. The organization and astonishing accomplishments of the United States Signal Corps constitute its broad subject. The character, personality, ideals—spiritual forces, as well as those intellectual and physical—of the institution affectionately called "Mother Bell" by thousands of her khaki-clad children in France, are its inspiration.

When the Bell System went to war, there was more than equipment and personnel in the mobilization.

"Circuits of Victory" contains 51 chapters besides an introduction. No other conclusion can be reached after reading it than that had the telephone system in America not reached its present stage of development until some future date, the history of the World War might have been a different one indeed.

The book measures 5½ inches wide by 8¼ inches in length and contains 634 pages. It is fully illustrated. The price of the work is $3.00 per copy, and orders may be sent to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

The Story of the 406th Telegraph Battalion, Signal Corps, United States Army

The story in book form of the Bell Battalion is now ready for delivery. It is a handsome volume, 7½ inches by 10¾ inches, bound in blue linen cloth with gold stamped cover. It contains 29[illegible] pages. There are three hundred illustrations. The frontispiece is in four colors. There are five maps. It tells by word and picture the work and play of the telegraph and telephone boys from the time the Battalion was organized, until the home coming celebrations. It is readable, interesting, at times serious and at times humorous. It contains an appendix showing the names of the telegraph and telephone people who were in the United States Military or Naval service during the war.

The edition is limited, and those desiring copies should order at once. The price of the book is $2.50 per copy, carrying charges prepaid, and those desiring copies should make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

War Memorial in the London Telegraph Office

A stone tablet has been placed in the main portico of the Central Telegraph Office in St. Martin's-le-Grand, in London, England, bearing the names of eighty-nine members of the staff who made the supreme sacrifice during the World War. The unveiling ceremonies, which occurred recently, were attended by the postmaster-general and most of the English telegraph officials.

The War Memorial Committee spared no effort that the memorial should be worthy of the office and of those whose memory it celebrates.

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Inter-Office Trunking

By HARRY E. HERSHEY
Of the Automatic Electric Co., Chicago

(*Continued from page* 488, *November* 1*st issue*)

Center. Primary line switches, secondary line switches and first selectors. The second and seventh level in the banks of the first selectors are multipled. The second, fifth, sixth and eighth levels go to corresponding groups of repeaters. Outgoing secondary line switches are inserted between the fifth level of the first selector banks and the corresponding group of repeaters. The second group of repeaters are attached to trunks which terminate on incoming second selectors at Main. The fifth group of repeaters lead to incoming second selectors at Calhoun. The sixth group of repeaters lead to incoming second selectors at 6th Switching. The eighth group of repeaters lead to incoming second selectors at Calhoun. The sixth group of repeaters lead to incoming second selectors at 6th Switching. The eighth group of repeaters lead to incoming second selectors at Park. The third level in the banks of the first selectors lead to local second selectors. The fourth level in the banks of the first selectors lead to local second selectors at 4th Switching. The banks of the incoming and local second selectors and of the incoming second selector repeaters are multipled and lead to local third selectors. The banks of the third selectors lead to groups of connectors, with the exception of the ninth level in the last group, which leads to fourth selectors. The banks of the fourth selectors lead to the party line connectors.

Calhoun. Primary line switches, secondary line switches and first selectors. The second and seventh level in the banks of the first selectors are multipled. The second, third, fourth and eighth levels go to corresponding groups of repeaters Outgoing secondary line switches are inserted between the third level of the first selector banks and the corresponding group of repeaters. The second group of repeaters are attached to trunks which terminate on incoming second selector repeaters at Main. The third group of repeaters lead to incoming second selectors at Center. The fourth group of repeaters lead to incoming second selectors at 4th Switching. The eighth group of repeaters lead to incoming second selectors at Park. The fifth level in the banks of the first selectors lead to local second selectors. The sixth level in the banks of the first selectors lead to local second selectors at 6th Switching. The first, second, third, fourth and fifth levels in the banks of the incoming second selectors, the local second selectors and the incoming second selector repeaters are multipled and lead to local third selectors. The ninth level in the banks of the incoming and local second selectors are multipled and lead to a group of repeaters which are attached to trunks which terminate on incoming third selectors at Harriet. The ninth level in the banks of the incoming second selector repeater is connected to the corresponding group of trunks between the repeaters and the incoming third selectors. The banks of the incoming and local third selectors are multipled and lead to groups of connectors, with the exception of the ninth level in the last group, which leads to fourth selectors. The banks of the fourth selectors lead to the party line connectors.

Sixth Switching. The banks of the incoming and local second selectors are multipled, and the first, second, fourth, fifth and sixth levels lead to corresponding groups of repeaters. The first and second groups of repeaters are attached to trunks which terminate on incoming third selectors at Snelling. The fourth, fifth and sixth groups of repeaters lead to incoming third selectors at Grove.

Harriet. Primary line switches and first selectors. The second and seventh levels in the banks of the first selectors are multipled. The second, third, fourth, sixth and eighth levels go to corresponding groups of repeaters. The second group of repeaters is attached to trunks which terminate on incoming second selector repeaters at Main. The third group of repeaters lead to incoming second selectors at Center. The fourth group of repeaters lead to incoming second selectors at 4th Switching. The sixth group of repeaters lead to incoming second selectors at 6th Switching. The eighth group of repeaters lead to incoming second selectors at Park. The fifth level in the banks of the first selectors lead to local second selectors. The first, second, third, fourth and fifth levels in the banks of the local second selectors lead to corresponding groups of repeaters, which are attached to trunks terminating on incoming third selectors at Calhoun. The ninth level in the banks of the local second selectors lead to local third selectors. The banks of the incoming and local third selectors are multipled and lead to groups of connectors, with the exception of the ninth level in the last group, which leads to fourth selectors. The banks of the fourth selectors lead to the party line connectors.

Snelling. Primary line switches and first selectors. The second and seventh levels in the banks of the first selectors are multipled. The second, third, fourth, fifth and eighth levels go to corresponding groups of repeaters. The second group of repeaters are attached to trunks which terminate on incoming second selectors at Main. The third group of repeaters lead to incoming second selectors at Center. The fourth group of repeaters lead to incoming second selectors at 4th Switching. The fifth group of repeaters lead to incoming second selectors at Calhoun. The eighth group of repeaters lead to incoming second selectors at Park. The sixth level in the banks of the first selectors lead to local second selectors. The first and second levels in the banks of the incoming second selectors, the local second selectors and the incoming second selector repeaters are multipled and lead to local third selectors. The fourth, fifth and sixth levels in the banks of the incoming and local second selectors are

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multipled and lead to corresponding groups of repeaters, which are attached to trunks terminating on incoming third selectors at Grove. The fourth, fifth and sixth levels in the banks of the incoming second selector repeaters are connected to the corresponding groups of trunks between the repeaters and the incoming third selectors. The banks of the incoming and local third selectors are multipled and lead to groups of connectors, with the exception of the ninth level in the last group, which leads to the fourth selectors. The banks of the fourth selectors lead to the party line connectors.

Grove. Primary line switches, secondary line switches and first selectors. The second and seventh level in the banks of the first selectors are multipled. The second, third, fourth, fifth and eighth levels go to corresponding groups of repeaters. The second group of repeaters are attached to trunks which terminate on incoming second selector repeaters at Main. The third group of repeaters lead to incoming second selectors at Center. The fourth group of repeaters lead to incoming second selectors at 4th Switching. The fifth group of repeaters lead to incoming second selectors at Calhoun. The eighth group of repeaters lead to incoming second selectors at Park. The sixth level in the banks of the first selectors lead to local second selectors. The first and second levels in the banks of the local second selectors lead to corresponding groups of repeaters, which are attached to trunks terminating on incoming third selectors at Snelling. The fourth, fifth and sixth levels in the banks of the local second selectors lead to local third selectors. The banks of the incoming and local third selectors are multipled and lead to groups of connectors, with the exception of the ninth level of the last group, which leads to fourth selectors. The banks of the fourth selectors lead to the party line connectors.

Park. The fourth and fifth levels in the banks of switches and first selectors. The second and seventh level in the banks of the first selectors are multipled. The second, third, fourth, fifth and sixth levels go to corresponding groups of repeaters. The second group of repeaters are attached tc trunks which terminate on incoming second selectors at Main. The third group of repeaters lead to incoming second selectors at Center. The fourth group of repeaters lead to incoming second selectors at 4th Switching. The fifth group of repeaters lead to incoming second selectors at Calhoun. The sixth group of repeaters lead to incoming second selectors at Snelling. The eighth level in the banks of the first selectors lead to local second selectors. The first, second and third levels in the banks of the incoming and local second selectors are multipled and lead to local third selectors. The fourth and fifth levels in the banks of the incoming and local second selectors are multipled and lead to corresponding groups of repeaters, which are attached to trunks terminating on incoming third selectors at Dale. The banks of the incoming and local third selectors are multipled and lead to groups of connectors, with the exception of the ninth level in the last group, which leads to fourth selectors. The banks of the fourth selectors lead to the party line connectors.

Dale. Primary line switches, secondary line switches and first selectors. The second and seventh level in the banks of the first selectors are multipled. The second, third, fourth, fifth and sixth levels go to corresponding groups of repeaters. The second group of repeaters are attached to trunks which terminate on incoming second selectors at Main. The third group of repeaters lead to incoming second selectors at Center. The fourth group of repeaters lead to incoming second selectors at the 4th Switching. The fifth group of repeaters lead to incoming second selectors at Calhoun. The sixth group of repeaters lead to incoming second selectors at Snelling. The eighth level in the banks of the first selectors lead to local second selectors. The first, second and third levels in the banks of the incoming and local second selectors go to corresponding groups of repeaters, which are attached to trunks terminating on incoming third selectors at Park. The fourth and fifth levels in the banks of the incoming and local second selectors are multipled and lead to local third selectors. The banks of the incoming and local third selectors are multipled and lead to groups of connectors, with the exception of the ninth level in the last group, which leads to fourth selectors. The banks of the fourth selectors lead to the party line connectors.

Main. Primary line switches, secondary line switches and first selectors. The second and seventh level in the banks of the first selectors are multipled. The third, fourth, fifth, sixth and eighth levels go to corresponding groups of repeaters. The third group of repeaters are attached to trunks which terminate on incoming second selectors at Center. The fourth group of repeaters lead to incoming second selectors at 4th Switching. The fifth group of repeaters lead to incoming second selector repeaters at Calhoun. The sixth group of repeaters lead to incoming second selectors at Snelling. The eighth group of repeaters lead to incoming second selectors at Dale. The second level in the banks of the first selectors lead to local second selectors. The first, second, third, fourth, fifth and sixth levels in the banks of the incoming and local second selectors and in the incoming second selector repeaters are multipled and lead to local third selectors. The seventh, eighth and ninth levels in the banks of the incoming and local second selectors and in the incoming second selector repeaters are multipled and lead to local third selectors. The seventh, eighth and ninth levels in the banks of the incoming and local second selectors are multipled and lead to corresponding repeaters. The seventh and eighth groups of repeaters terminate on incoming third selectors at East. The ninth group of repeaters terminate on incoming third selectors at South. The seventh, eighth and ninth levels in the banks of the incoming second selector

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repeaters are connected to corresponding groups of trunks between the repeaters and the incoming third selectors. The banks of the local third selectors lead to connectors, with the exception of the ninth level in the last group, which leads to fourth selectors. The banks of the fourth selectors lead to the party line connectors.

East. Primary line switches, secondary line switches and first selectors. The second, third, fourth, fifth, sixth and eighth levels in the banks of the first selectors go to corresponding groups of repeaters. The second group of repeaters are attached to trunks which terminate on incoming second selectors at Main. The third group of repeaters lead to incoming second selector repeaters at Center. The fourth group of repeaters lead to incoming second selector repeaters at 4th Switching. The fifth group of repeaters lead to incoming second selector repeaters at Calhoun. The sixth group of repeaters lead to incoming second selector repeaters at Snelling. The eighth group of repeaters lead to incoming second selectors at Dale. The seventh level in the banks of the first selectors lead to local second selectors. The seventh and eighth levels in the banks of the local second selectors lead to local third selectors. The ninth level in the banks of the local second selectors go to repeaters, which are attached to trunks terminating on incoming third selectors at South. The banks of the incoming and local third selectors are multipled and lead to groups of connectors, with the exception of the ninth level in the last group, which leads to fourth selectors. The banks of the fourth selectors lead to the party line connectors.

South. Primary line switches and first selectors. The second, third, fourth, fifth, sixth and eighth levels in the banks of the first selectors go to corresponding groups of repeaters. The second group of repeaters are attached to trunks which terminate on incoming second selectors at Main. The third group of repeaters lead to incoming second selector repeaters at Center. The fourth group of repeaters lead to incoming second selector repeaters at 4th Switching. The fifth group of repeaters lead to incoming second selector repeaters at Calhoun. The sixth group of repeaters lead to incoming second selector repeaters at Snelling. The eighth group of repeaters lead to incoming second selectors at Dale. The seventh level in the banks of the first selectors lead to local second selectors. The seventh and eighth levels in the banks of the local second selectors go to repeaters which are attached to trunks terminating on incoming third selectors at East. The ninth level in the banks of the local second selector lead to local third selectors. The banks of the incoming and local third selectors are multipled and lead to groups of connectors, with the exception of the ninth level in each group, which leads to fourth selectors. The banks of the fourth selectors lead to party line connectors.

The Tracing of Calls Through the Network, Calling 62500 from Spruce

At Spruce; primary line switch, secondary line switch and call 6 on first selector. Seize repeater and outgoing trunk which terminates on an incoming second selector at 6th Switching. Call 2 on incoming second selector, seize repeater and outgoing trunk which terminates on an incoming third selector at Snelling. Call 5 on incoming third selector and complete connection by the use of the seized connector.

Calling 62500 from Calhoun

At Calhoun; primary line switch, secondary line switch and call 6 on first selector. Seize local second selector at 6th Switching. Call 2 on a local second selector, seize repeater and outgoing trunk which terminates on an incoming third selector at Snelling. Call 5 on incoming third selector and complete connection by the use of the seized connector.

Calling 62500 from East

At East; primary line switch, secondary line switch and call 6 on first selector. Seize repeater and outgoing trunk which terminates on an incoming second selector repeater at Snelling. Call 2 on incoming second selector repeater and seize a local third selector. Call 5 on local third selector and complete connection by the use of the seized connector.

Calling 78500 from North

At North; primary line switch, secondary line switch and call 7 on first selector. Seize repeater and outgoing trunk which terminates on an incoming second selector repeater at Main. (Since the second and seventh levels are tied together.) Call 8 on incoming second selector repeater and seize trunk terminating on an incoming third selector at East. Call 5 on incoming third selector and complete connection by the use of the seized connector.

Calling 78500 from South

At South; primary line switch and call 7 on first selector, seize local second selector. Call 8 on local second selector and seize repeater and outgoing trunk terminating on an incoming third selector at East. Call 5 on incoming third selector and complete connection by the use of the seized connector.

It will be seen that sometimes an incoming trunk terminates on an incoming second selector, and then again it may terminate on an incoming second selector repeater. When the resistance of the loop between repeater and associated incoming selector exceeds 1,200 ohms it is customary to use a selector repeater. The loop into the selector repeater never varies, and therefore the repeater part of the selector can be adjusted to compensate for its particular circuit.

From the trunking scheme shown in Fig. 33, November 1st issue, it is apparent that both East and South are branches working out of Main, notwithstanding the fact that the first figure in

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their numbers is a 7 instead of a 2. This is done in order to save cable pairs, for if East were made a main office and South a branch out of East, it would mean that each office in the network would have to have a group of trunks leading to East. So long as there are three thousands to spare in Main, East and South can work out of that office and thus utilize the incoming trunks to Main. But if Main should grow to such an extent as to need these three thousand numbers it will be necessary to make East a Main office. In order to provide for this contingency the second and seventh levels in the banks of the first selectors in all offices except East and South have been multipled. Thus, when a person calls an East or South number the call is made as though East were a Main office, but the call passes through the switchboard as though both East and South were branches out of Main. When the time comes to make the change the extra cable pairs will be run and the multiple between the second and seventh levels in the bank of the first selectors will be cut. As a result the calls will go through in the new way, but there will be no change in the directory numbers.

Center and 4th Switching are housed in the same building, as are also Calhoun and 6th Switching.

QUESTIONS

Trace the following calls:

A. Calling 839500 from Spruce, from Harriet, from North.
B. Calling 36500 from Center, from South.
C. Calling 831992 from Harriet, from Main.
D. Calling 799000 from South, from East, from Calhoun.
E. Calling 85500 from Spruce, from East.

The Baudot Printing Telegraph System

The issue of a second edition of the "Baudot Printing Telegraph System," by H. W. Pendry, is fully justified by the extension of the use of that system in the United States and in Europe, the improvements made in the apparatus, and the general adoption of the first edition as a class manual.

The descriptions and diagrams of somewhat intricate instruments and connections are so clear that it is possible to obtain a good knowledge of the system from the book alone, without the necessity of seeing and using the instruments before the information in the book can be said to have been usefully assimilated.

Of the new matter introduced, the most notable is that treating of the Murray phonic motor and the Gulstad Relay. The chapters on Duplex Baudot and Baudot repeaters has been enlarged. The number of illustrations and diagrams has been increased from 72 to 94. The price of the book is $2.50 per copy, and orders should be addressed to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

The St. Louis Convention of the Telephone Pioneers of America

The Convention of the Telephone Pioneers of America was held at St. Louis, Mo., on October 24th and 25th, and it was a noteworthy occasion in all respects. The Pioneer special, with the Eastern delegates, left New York on October 21st. Stops were made at Niagara Falls and Indianapolis, where the delegates were entertained by local telephone officials.

President H. B. Thayer presided at the business meeting, and J. J. Carty was elected president for the ensuing year. The vice-presidents selected were: F. A. Stevenson, New York; B. L. Kilgour, Cincinnati; C. H. Rottger, Indianapolis; J. J. Robinson, St. Louis; secretary, R. H. Starrett, New York; treasurer, F. A. Butterick, New York; executive committe: T. P. Sylvan, New York; John H. Cassman, Chicago; Miss Mary T. Reuse, New York; B. A. Kaiser, New York, and J. E. Warren, Atlanta.

The membership of the Association now numbers 2,280. The time and place for the next convention will be decided upon later by the executive committee.

The banquet on the evening of October 25th concluded two days of continuous entertainment, and the gathering was one of the largest in the history of the Association.

Two special trains conveyed the delegates to Chicago and New York. The Eastern party stopped a few hours at Cleveland, where they were entertained by the Ohio Bell Telephone Company, which was a welcome break in the long trip from St. Louis to New York.

Association of Western Union Employees

At the annual convention of the Association of Western Union Employees, held at Detroit, Mich., last month, considerable business of importance was transacted.

Many resolutions pertaining to the membership at large were adopted.

The next general assembly will be held at St. Louis, Mo., in June, 1923, instead of September. The term of the officers of the Association, both national and divisional, is now two years instead of one year, as heretofore.

Joseph P. Hayes was re-elected president for that office.

James G. Hayes was re-elected general secretary-treasurer by acclamation, having no opposition.

All the present vice-presidents of the eight divisions were re-elected in their respective division assemblies, which were held in August preceding the convention. They are: P. F. Harrington, Boston, Mass.; Richard F. Murphy, New York; George H. Campion, Chicago, Ill.; C. S. Turner, Atlanta, Ga.; A. R. McPherron, Kansas City, Mo.; W. C. Welch, Dallas, Texas; H. L. Esch, Denver, Col., and A. F. Schmidt, Portland, Ore.

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General Methods of Signaling by Radio at Sea

Rear Admiral W. H. G. Bullard, Director of Naval Communication Service, Navy Department, Washington, D. C., some time ago delivered an address before the Franklin Institute, Philadelphia, on the subject of "The Application of Radio to Navigation Problems." Admiral Bullard said that the proper method of synchronous signaling is eliminated in cases where sounds or signals are made simultaneously in the air or under water. Thus, if a vessel, a lightship, for example, is so arranged that it will emit a sound in the air such as is caused by a steam whistle, and a sound under the water is emitted, say, by a stroke on a bell, the sounds will reach an observer at different times, depending upon the relative velocities of air and water. If this interval between the sounds can be noted by a stop watch, the distance from the signaling stations can be readily obtained. If a sound signal in the air is replaced by a radio signal, a simple means is at once found to obtain the required distance from source of sounds. Thus, if an arrangement is made so that a radio dot is sent out at intervals of about .6 of a second, a submarine bell stroke being sent at the same time, the latter lags the interval between two dots for about each half sea mile traveled. If the ship is five miles from the sending station, the sound lags five times the interval, and the bell comes in on the 10th dot, supposing the first radio dot is emitted .6 of a second later than the first bell stroke. In this case it is only necessary to count up the number of radio dots and count the number of half sea miles separating the ship from the signaling station. By interpolation it is quite possible to tell when the bell stroke falls somewhere between two consecutive radio dots, and an estimation to the one-fourth sea mile is feasible.

The Fessenden oscillator has long been a rival to the undersea bell as a means of sending sound waves in water, and it seems highly probable that on large ships it will take the place of the bell. As the result of an experiment, claims have been laid to: (1) Increased radius of audibility up to thirty miles or more; (2) Easy signaling over these distances of Morse code, by ordinary telegraph key; (3) Reception and emission of signals by one and the same apparatus, located in a ship or lowered overboard; (4) Determination of depth beneath the moving vessel by echo from the bottom; (5) Location of icebergs by reflected sound from submerged part of the berg.

Other uses of radio to warn mariners of danger into which they may be running, are provided by small radio telephone sets located at important points. Thus, by a phonographic arrangement connected with an automatic radio telephone set, constant words may be spoken by the set, which carries over a certain determined range, which is greater than the visible range. Thus, at Point Judith, an arrangement of this kind was made so that the intensity of the sound and radiation of the transmitter were so decided that ships equipped with the ordinary antenna would hear the signals the same approximate distance and light could be seen in clear weather. The automatic arrangement emits the name of the station every five seconds. When that is first heard the observer knows that he is about the same distance from the station that he would view the light in clear weather. As the ship approaches the station, another automatic signal, which is continually being given out, but which is only heard at a reduced distance, gives a speech something like this: "You are getting closer! Keep off!" This indicates that the ship is too close to the sending station and must change her course to increase the distance. This signal also should only be heard at a certain distance, which the navigator knows. This instrument has been called the radiophone and it is intended to set up several of these radiophones at different stations on the Atlantic and Pacific coasts. These radiophones used in connection with a radio compass aboard ship, readily enable the navigator not only to obtain his bearing from the sound, but also his approximate distance.

Ships fitted with electric oscillators may readily communicate with one another by underwater signals in thick or foggy weather, when they cannot be seen by one another. Each ship may then signal to the other its course and speed, and each ship individually receiving this information can form a reliable estimate of the bearing of the others and the relative distances by the varying intensity of signals, and thus more readily maneuver in order to avoid collisions.

The Worlds Series Baseball Games

Hundreds of millions of pounds of copper wire form the backbone of this country's telegraph and telephone system, and every part of this vast network of wires had some part, directly or indirectly, to play in satisfying the appetite of the baseball fans for news of the recent world championship series.

Upon the skill of fifty-five telegraph operators sitting at the long table in the press box at the Polo Grounds, depended the speed and correct transmission of the details of the games. These Western Union operators, chosen because of their proficiency and knowledge of the sport, included a few operators sent direct from their newspapers. They were in charge of fifty-five direct wires from the Polo Grounds. Ten other employees assisted them in seeing to it that messages went through at top speed. This direct wire service from the press box extended as far as Kansas City, where fans awaited the news on the bulletin boards of local newspapers.

Approximately 225,000 words were sent each day over these wires. On the first day alone, 16,000 words were forwarded to one New York evening paper.

If this skein of direct wires were untied and "strung end to end" it would be found to extend more than 100,000 miles.

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY

By Louis Casper

Lesson 39

Escapes and Leakages of Current Upon Land Lines

Telegraph wires which are held by insulators on a pole line are necessarily in contact with such supports. When the insulation is defective, or the surrounding air heavily loaded with moisture, a considerable portion of the current which is generated at the terminal of the wire, escapes from the insulators and finds its way to the earth as well as into the immediate atmosphere. The conductivity of the atmosphere depends upon the amount of moisture contained in it, but in any case the conductivity of the air is small, even under most unfavorable conditions, as compared with moisture-soaked insulators and poles. During dry weather, the shape or design of the insulators has but little influence upon the amount of current which escapes from the line to the earth; when, however, the weather is damp, foggy or rainy, the insulators and poles become covered with a conducting film of moisture and under these circumstances the shape and kind of insulator has a material effect upon the loss of current which takes place. In addition to this, dust, smoke and other impurities collect more or less upon the surfaces of the insulators as well

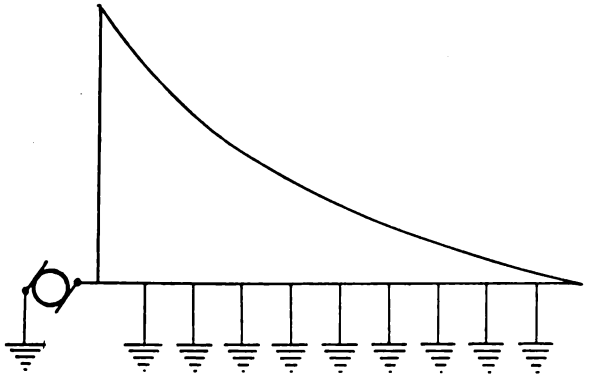

FIG. 108

as the cross-arms and poles themselves, especially in the vicinity of manufacturing or other localities where bituminous coal is burned, and thus a conducting medium is formed to the earth, which often occasions serious "escapes" or losses of current. As the number of these points of escape increases in direct proportion to the number of supports, the insulation of a land line is increased by diminishing the number of poles. It is obvious, however, that the line must be amply supported against wind and storm stress, hence, a well-defined pole spacing must be rigidly adhered to, this spacing being dependent upon the number and character of the lines to be supported.

Insulation and Conductor Resistance

The true resistance of a line is the joint resistance of all paths along which a current can escape or leak to earth. If the line be open at the distant end, the insulation will consist of the joint resistance of all the insulators to the passage of current over their surfaces to earth.

The true conductor resistance of a line is the resistance of the line wire itself. The true insulation resistance and the true conductor resistance are two separate propositions. In most of the tests made in general practice, the "apparent" insulation resistance and the "apparent" conductor resistance are measured, and in these cases the two measurements are interdepedent, for, the apparent insulation resistance is the true insulation resistance modified by the value of the true conductor resistance, and, similarly, the apparent conductor resistance is modified by the insulation resistance. The apparent insulation resistance is always higher, and the apparent conductor resistance is lower than their true values because each of the numerous leakage paths shunts that portion of the line beyond it, allowing part of the current to return to the testing station without passing through the ground connection at the distant station. The principal utility of these apparent resistance values is that they enable us to calculate by Ohm's law the current that will flow into the circuit at the sending station from a source of current of any given voltage at that station.

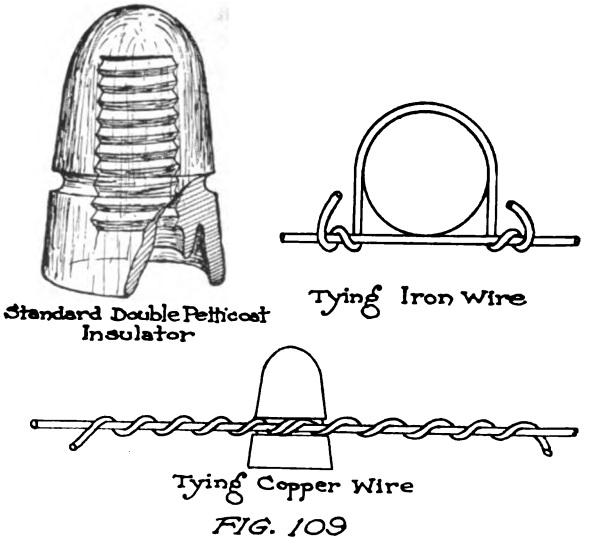

FIG. 109

From this certain important facts may be adduced which will be well to remember in the studies of duplex transmission which are to follow. The first is that the greatest current in the line flows in the section nearest to the home battery. Second, the smallest current flow is in the section most distant from the home battery. The nearer a ground leak is to the home battery, the greater will be the current directed through that leak. Finally, in figuring the fall of potential on a line terminal, the potential fall is greatest nearest the home station and smallest at the vicinity of the dis-

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tant terminal. This is illustrated in Fig. 108, showing the potential gradient curve for a line, assuming that the leakage is evenly distributed throughout its entire length.

Insulators

It is essential that an insulator for aerial purposes should have a high electrical resistance combined with strength and permit of a good hold upon the wire. It should also shed rain freely, have no dark recesses for the nesting of insects and be reasonably cheap.

In Europe, porcelain and earthenware insulators are extensively employed. They are used in this country only to a limited extent, glass insulators being almost universally adopted for telegraph lines. The tendency has been to make the glass insulators somewhat smaller than the porcelain or earthenware arrangements used in Great Britain. The difference in climate will, however, account for the dissimilarity in size and material. The insulation of telegraph lines in this country, however, will usually test as high as those in Europe. Moreover, it is not necessary to keep the insulation of telegraph lines as high as they can be made. It has been found that a certain amount of well-distributed leakage over a line is more beneficial than otherwise.

Glass insulators have several disadvantages as an insulating material and these have contributed largely to make its use as an insulator uncommon in England, where the air is generally charged with moisture. They are very hygroscopic, readily condensing moisture and retaining a thin film of water on its surface, and is especially brittle, more so than earthenware or good porcelain. Blown glass is better in every respect than cast or ground glass for insulators, as the surface is less hygroscopic than a surface formed in contact with a mould or by grinding. Nevertheless, cast glass insulators are almost universally used in this country, as they are much cheaper than blown glass, and give a sufficiently good insulation. One of the greatest advantages of glass insulators is their transparency, for cocoons are less apt to be made under them than under opaque bodies, such as porcelain and stoneware.

The design of the glass insulators in use in this country vary in a number of ways as to their shape, location and depth of groove for the wire, the depth of the hole for the supporting pin, the number and depth of the screw threads within the insulator, etc.

The general appearance of a standard insulator is shown in Fig. 109, which is of the double petticoat pattern, the latter feature being shown in part cross-section.

The method of tying the wire to an insulator is important.

The manner of tying copper wire is quite different to the tie made on iron wire. In the Fig. 109 the tie is shown for a copper line. This is accomplished by one end of the tie wire being placed over the line and the other end under it, both ends are then drawn tight and each end wrapped five times around the line wire. The wraps are always made by hand without the use of tools of any kind. The method of tying iron wire is also shown in Fig. 109. The ends of the iron tie wires are wrapped twice around the line wire and are bent in toward the groove of the insulator, as shown in the figure.

(*To be continued*)

Correction. In Lesson 38, page 495, should read "the maximum allowable resistance for grounds is given herewith."

Improving the Telegraph Service

By S. F. Weller, Chicago

I recently outlined a plan which I thought might result in an increase of revenue to telegraph companies and I also made some suggestions which I offer in regard to the movement of traffic.

1. Arrange a new system of insuring important telegrams and letters in the same manner that the Government Postal Department handles important packages, by issuing insurance stamps to cover any amount of risk from $5 to $10,000, and also special rush stamps for messages that need to be rushed through on a quick time limit. The company and its employees have been doing insured service and making special efforts to rush an urgent message through, but the companies have not been paid for this extra service by their patrons. I recommend that uninsured telegrams and letters be handled without the labor of operators counting and verifying checks, but with simply a classified check indicating how many words have been paid for.

2. Number sheet forms used in 1885 are still in use and I suggest an entire new system of numbering messages and forms be adopted.

3. Pure Morse, like correct English, has become somewhat extinct since the advent of the vibroplex, but I have found it unquestionably true that it is not the fault of the sending machine, but carelessness and lack of skill or technique on the part of the operator. What is greatly needed to raise Morse work up to a better standard than it has ever reached is a more perfect standardization of this method, which will result in perfect formation and correct spacing and rhythm.

4. Last, but not least, a more brotherly co-operation is needed on all circuits, way or trunk, and the elimination of wrangling and uncourteous language, more patience and good will. It certainly pays to act gentlemanly on a circuit than to confuse an inferior operator with impatient complaints and sarcastic abuse.

The writer, an old-timer in Chicago, and one of the last of the Mohicans of his family, who were pioneers in the Morse method and among the first to read by sound, offers these suggestions for the greatest good and efficiency of the service.

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EDITORIAL COMMENT

Institution of Post Office Electrical Engineers

The Council is pleased to announce that the Postmaster-General has awarded to Lt.-Col. A. C. Booth, M.I.E.E., of London, the sum of £100 in recognition of his invention and services in connection with improvements in telegraph working. This applies more particularly to the development of the Booth-Baudot Duplex giving 6, 8, 10 or 12 channels per circuit in place of the 3, 4, 5 and 6 channels of the ordinary Baudot as used in France for some forty years.

Lt.-Col. Booth has handed over the £100 to be utilized at the discretion of the Council in annual awards for the best improvement in telegraph land line apparatus, or systems.

An annual award of £5, to be known as The Booth--Baudot Duplex Award, is therefore offered for the best improvement in telegraph land line apparatus or systems, to be governed by the following conditions:

1. British subjects only, employed by public telegraph administrations throughout the world, will be eligible to compete for the award.

2. Applications for the award to be received between January 1st and March 31st of any year, such applications referring to improvements made, or suggested, during the twelve months prior to January 1st referred to.

3. At the discretion of the Council of the Institution of Post Office Electrical Engineers, an award may be withheld in any year, if, in the opinion of the adjudicators appointed by the Council, after full consideration of the application received, no award is warranted.

4. Applications for the award, accompanied by full details of the improvement, should be addressed to the Secretary, Institution of Post Office Electrical Engineers, G. P. O. West, London, E. C., England.

The French Cable Co. and Wireless Interests

M. Ernest May, chairman of the Compagnie Francaise des Cables Telegraphiques, addressing the shareholders at the recent annual meeting, stated that, as was known, the company had subscribed for 20,000 shares in the Compagnie Generale de Telegraphie Sans Fil. When the directors became interested in the latter they thought that it would carry on wireless telegraphy between France and the countries served by the cables of the Compagnie Francaise, and that it perhaps would compete with the cables. During the course of the war the Compagnie Francaise asked for authority to establish installations of wireless telegraphy, but the application was refused. The directors, however, obtained an interest of 20 per cent. in the new company. The French Telegraph Administration gave authority to the Compagnie Generale de Telegraphie Sans Fil to establish a station which would in particular communicate with transatlantic countries—those which the Compagnie Francaise serves with its cables—while at the same time imposing upon the former the obligation to constitute a special company for the working of this station. Consequently, in order to participate appropriately in the matter which interested them—that is to say, communication with the North of America and the West Indies—the directors of the cable company were naturally induced to subscribe also 20 per cent. of the capital in the new company. Down to the present time, the first augmentation in the capital of the cable company from 13,000,000 to 16,000,000 fr. and the reserves which had been formed had permitted of the subscription of the shares in the Compagnie Generale, and had also enabled the company to pay the first installments on the shares of a 20 per cent. participation in the Societe Radio-France, which would work the station. But after paying out the dividends to the shareholders in the cable company for the past year, the remaining funds at the disposal of the company would probably not suffice to complete the payments for the shares in the Radio-France. It was, therefore, proposed to convene a special meeting to authorize the directors to raise additional capital according to needs and up to an amount of 8,000,000 fr., and the conditions of the augmentation would be settled in consultation with the company's bankers.—*London Electrical Review.*

Telegraph and Telephone Life Insurance Ass'n

Assessments Nos. 709, 710 and 711 have been levied by the Telegraph and Telephone Life Insurance Association, New York, to meet the claims arising from the deaths of Lewis A. Riley, Philadelphia, Pa.; James F. McGuire, Brooklyn, N. Y.; Henry Huber, Van Etten, N. Y.; Wallace E. Seaman, Brooklyn, N. Y.; Frederick H. Campbell, Allensville, Ky.; Frederick Lulves, Brooklyn, N. Y.; William A. Austin, Providence, R. I.; David Demar, Hartford, Conn.; George F. Milliken, Boston, Mass., and William G. Chittenden, Vancouver, B. C.

Accompanying the assessment is a circular letter signed by the secretary, N. M. Giffen, which reads: "*To the Members of the First Division, Telegraph and Telephone Life Insurance Association*:

"During the past ten months we have been compelled to use $10,000 of our Reserve Fund and all of the interest received from the investment of the Reserve Fund amounting to $12,000, a total of $22,000, to meet our mortuary liability. In view of this fact and for the reason that we have death claims amounting to $15,000 falling due the remainder of this year, your committee find it ncessary to call three assessments for the month of November, 1921."

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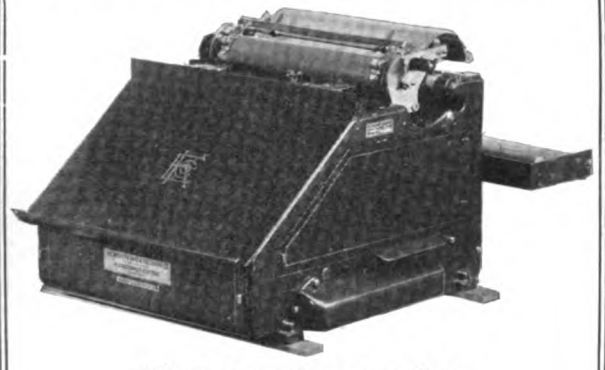

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TELEGRAPH AND TELEPHONE

The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

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Primary Battery Division, Bloomfield, N. J.

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THE RAILROAD

Telegraph and Telephone Section of the American Railway Association

On November 14th and 15th a meeting of Sub-Committee A—Construction and Maintenance—Pole Lines, was held in New York for the purpose of starting the work on the detailed specifications. It is hoped that at this meeting sufficient of the specifications will be drafted so that they can be presented for discussion at the March, 1922, meeting, which will be held at Richmond, Va. This committee will also take up for consideration the question of creosoting wooden poles, standard telephone cable and other similar matters.

On November 16th it is expected that Committee B—Wire Crossings, will hold a meeting at New York, to go over the minor changes in the recent wire specifications which had to be presented for letter ballot approval.

On November 17th and 18th the special committee on Rules and Organization will hold a meeting at New York to continue its work.

On November 19th the Committee of Direction will hold a meeting in New York to dispose of routine matters that have accumulated since the annual session held at Cleveland, Ohio, last September.

Death of E. A. Chenery

E. A. Chenery, superintendent of telegraph of the Missouri Pacific Railway Company, St. Louis, Mo., died suddenly of apoplexy on November 8th. Mr. Chenery was one of the best known figures in railroad, telegraph and telephone circles, being a man of progressive ideas and high standing.

Mr. Chenery was born at sea on the Atlantic Ocean, October 17th, 1859. His entry into the railway service dates from 1872, beginning as a telegraph operator with the Grand Rapids and Indiana Railway, in which interests he afterward became yardmaster. From January 9th, 1879, to June 15th, 1886, he was with the Galveston, Harrisburg and San Antonio Railway, filling, respectively, the positions of telegraph operator, train dispatcher, car accountant and secretary to the general superintendent. For a period of six months, June 20th to December 15th, 1886, he was secretary to the general superintendent of the Union Pacific Railroad. On January 13th, 1887, he accepted the superintendency of telegraph of the Terminal Railroad Association of St. Louis, and of the St. Louis Merchants' Bridge Terminal Railway. In July, 1903, he was appointed superintendent of telegraph of the Missouri Pacific Railroad Company, to succeed the late C. W. Hammond, which position he occupied until the time of his death.

Funeral services were held at 10 a. m., November 10th, at Lupton's Chapel, and were attended by a large number of friends and official associates. The floral contributions were numerous and beautiful. The remains were cremated.

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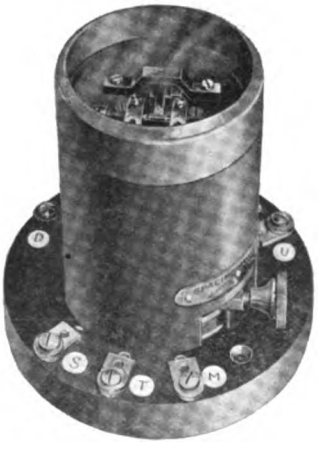
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Some Phases of Railroad Telegraph and Telephone Engineering

By J. Brown, Beaver Dam, Ohio

In the October 16th issue, in an article on polar duplexes, Wm. Maver, Jr., takes issue with Stanley Rhoads on the existence of "a tendency for the polar relay to write heavy when the home key is closed," etc.

We take it that Mr. Maver would be interested in anything bearing on the subject, therefore, "Here goes."

To begin with, it has been known for some time that the tendency, or rather the condition, does exist and that it has been one of the worst bugbears in high speed telegraphy.

The whole thing centers on the fact that when the home key is closed, on an incoming signal, the home relay closes as soon as the distant polechanger leaves its open contact, for the reason that while the distant polechanger is actually detached from both of its contacts we have a busted condition. The busted condition with our home key closed is naturally a closed relay.

On the other hand, when our home key is open against an incoming signal, the home relay does not close until the distant polechanger actually reaches its closed contact for the reason that our busted condition is then an open relay.

In other words, when the home key is closed, the marking signals received on our home relay occupy the time taken by the distant polechanger moving from its open contact to its closed contact plus the time it rests on its closed contact plus the time taken moving back to its open contact, while the spacing signals occupy only the time it actually rests on its open contact.

And it follows that when our home key is open we have exactly the opposite, or the marking signals occupying the actual time of closed contact of the distant polechanger and the spacing signals occupying the time of travel both ways in addition to the time of actual open contact.

To make it plain, closing the home key adds the time of travel of the distant polechanger to our incoming *marking* signals, while opening our home key adds the time of travel to our spacing signals.

To conclude: The only known remedy is to work the polechanger points as close as possible, and that is exactly what is being done.

The Belgium Northern Railway Company is experimenting with a new signal system by which it is proposed to communicate with railroad towers and trains by radiotelegraphy.

There has been a great deal of talk lately in regard to the Pacific Cable Board laying an additional cable across the Pacific Ocean, duplicating the present facilities. The project is fast assuming definite form and no doubt within the next twelve months the cable will be in course of construction.

Telephone Equipment Employed in Train Operation

The telephone train dispatching line is essentially a party telephone line extending from the dispatcher's office to the various way-stations on his dispatching division, writes D. V. Weed, Jr., in part, in the *Electrical Review*. It consists of a metallic telephone circuit, to which certain calling apparatus is connected at the dispatcher's office, and an individual selector at each of the way-stations, in addition to the telephone apparatus. In the dispatcher's office the calling equipment is so arranged that a predetermined number of electrical impulses may be sent out at will to signal any one of the way-stations. These keys are so designed that the number of impulses sent by any one of them will actuate the corresponding selector at the way-station that is wanted. Therefore, only the station called answers when the dispatcher operates a key, and the average time required for establishing the connection is approximately three seconds.

Dispatcher's Lines Permit Simultaneous Telephone and Telegraph Messages

By simplexing and phantoming the train dispatching circuits, additional through telegraph and telephone circuits between terminal points or division headquarters may be obtained without any financial expenditure for increasing the outside wire plant.

When repeating coils or retardation coils are connected to the telephone circuit a simplex telegraph circuit results, over which it is possible to carry on simultaneous telephone and telegraph communication over a single pair of wires without interference. When similar coils are connected to two existing metallic telephone circuits in such a manner that a third through telephone circuit is provided over the two pair of wires, a phantom circuit is obtained. Thus, three telephone conversations may be carried on at the same time over the two original circuits, and practically every railroad having message or commercial circuits paralleling their train dispatching lines is using these wires to secure an additional circuit by means of the phantom.

Advantages of Verbal Dispatching in Supervision of Train Movement

It is obvious that the telephone has many advantages in train dispatching. The dispatcher issues his orders verbally and complete reports of the passing, arrival and departure of trains can be given in the fractional part of a minute, while information regarding accidents and other occurrences outside of the daily routine may be transmitted verbally in such complete form that the chances of misunderstanding, or necessity for additional messages, are practically eliminated.

The loud-ringing bell of the telephone insures an immediate response. The great accuracy of the telephone in transmitting orders is testified by the fact that, since the adoption of the telephone for directing train movements, not a single accident has resulted from its use.

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Of course, the use of the telephone is not limited to the dispatchers and station operators. Crews of passenger, freight and wreck trains are supplied with portable telephones by which they can get into immediate touch with headquarters in case of a breakdown or other accident occurring between stations, while these instruments have proved a great aid in the performance of the work of construction and bridge gangs. Also, track inspectors have prevented serious catastrophes by using this portable apparatus to report discovered washouts, loose rails, landslides or other sources of track trouble. These sets are provided with a line pole so that connection can be made at any point along the right-of-way.

In addition to the regular station sets, it is the policy of all railroads to install a large number of booth telephone sets along the right-of-way at passing tracks and sidings. Since these sets are connected to the dispatcher's line, the number of these booths will ordinarily exceed that of the regular stations. Another use of the telephone is for manual blocking. This service is very extensively used, particularly on roads not equipped with automatic block signals. The apparatus consists of magneto telephone sets connected to a circuit approximately five miles long and extends only to the next blocking office.

All yards are equipped for telephone service between switch shanties, towers and yardmasters' offices, while at all terminals there are telephones installed for transacting commercial business with the public.

The use of the telephone for train dispatching is not by any means confined to the United States and Canada, but has been adopted throughout the world.

Automatic Train Control

The Angus system for the automatic prevention of railway collisions was given a successful trial on the railway at Dyke, near Brighton, on September 22nd, when a large number of railway officials and other interested persons were present, says the *London Electrical Review*. The system, it is claimed, protects trains from collision at every part of the railway track, single or double, junctions, termini, crossings, sidings, etc. Each train is automatically warned if there is a risk of collision, but if not acted upon promptly then each locomotive automatically shuts off its motive power and applies the brakes to the train. A train thus stopped cannot proceed until the track is clear again. Trains can run at full speed through the densest fog or other adverse weather conditions without danger of collision. Each train is automatically protected against derailment at curves and points. Each locomotive is fitted with electrical instruments and mechanical appliances. It is to be specially noted that no shoes, contacts, or ramps are used on the tracks. The rails are bonded together with copper wires, and the line is divided into insulated sections. One of the locomotives was switched on to the same line as the other locomotive. When the two engines were nearing the same section two whistles were heard, and both engines were stopped automatically. No action whatever had been taken by the drivers. Mr. Angus's system is so arranged that the engine is stopped when there is anything on the line causing a short circuit. A defect on the locomotive, a breakage of the apparatus, a rail misplaced or a wire down, all have the same effect, the locomotive is brought to a stop.

PERSONAL

I. N. MILLER, formerly superintendent of the Western Union Telegraph Company at Cincinnati, Ohio, now retired from active service, has gone to Maimi, Fla., where he will spend the winter months, as has been his custom for several years past.

W. A. ROSENBAUM, patent attorney, New York, who has taken out hundreds of patents for telegraph and telephone people during the past thirty-five years, under the firm title of Rosenbaum, Stockbridge and Borst, has retired, and the firm hereafter will be known as Stockbridge and Borst.

POSTAL TELEGRAPH-CABLE COMPANY

E. P. TULLY, assistant to the general manager, is on a trip of inspection which will take him to most of the important cities in the Eastern Division.

J. P. O'DONOHUE, assistant chief engineer, is on a Western trip in connection with equipment matters.

VISITORS from out of town were numerous during the past two weeks. Their names will be found in the account of the Magnetic Club dinner, printed on another page.

New York City

MISS Kitty Obst, now Mrs. Scaarford, one of our former operators, celebrated a christening partv at her home last week for her young daughter, Jean.

C. P. DIXON, of West First Division, has returned to duty after an absence of six weeks, which he spent in Georgia visiting relatives.

MAE BOYLE is back on duty after an absence of six weeks, due to illness.

BEN HERTZFELD, one of our ex-soldiers, who graduated from the Day Telegraph School as an operator, is doing well on the wire.

THE Misses K. Clifford, K. O'Brien, M. Sullivan, M. Droesch, Mrs. A. Poinsett and M. Flood, of the Traffic Department, attended a masquerade ball on November 5th, given by the officers of the Aviation Field in Staten Island. They all made a hit with their speedy dance, which they attribute to the Postal speed.

Managers Appointed

R. V. Robinson, Ottawa, Ill.; C. S. Palmer, Fayetteville, N. C.; J. E. Roberson, Lynchburg, Va.; A. R. Horry, Greensboro, N. C.; Eunice Phillips, Prescott, Ark.; Thos. H. Berry, Kingman, Ariz.; A. Coutanche, Oneida, N. Y.; G. A. Phillips, Petersburg, Va., and Florence Sibley, Las Animas, Colo.

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Edward Reynolds on the Business Outlook

Edward Reynolds, vice-president and general manager of the Postal Telegraph-Cable Company, New York, on October 29th addressed the visiting managers and other officials of the company in New York on that date on the business outlook. Among other things he said that there is every reason for believing that the period of depression which followed the boom of 1919-1920 has about run its course, and that the trend of all business now is upward. Our own business is showing improvement, and those with whom we come in contact report that their business is getting better. The improvement hardly is perceptible in some quarters, but against this it is highly manifest in others, and between the two there seems to be more than a fair average of betterment.

The banking situation which, after all, is the foundation upon which all the remainder rests, hardly could be stronger. Our Federal Reserve system has worked into a tremendously strong position, with reserves higher than they have been in some years, and with more actual money and credit available than ever before. This is very important, for it means that the credit is all ready for whatever deserving enterprise may come along.

Most of the primary markets, which have been in bad slumps for months past, are recovering and give indications of a further recovery over the Winter and during next Spring. There recently has been noted a marked improvement in the dry goods and clothing trades, which augers well for the next few months, for it is a well-established fact that most people have not been buying for a long time and must soon start replenishing. This applies not only to consumers, but also to the retailers, who have been conducting their business on a hand-to-mouth basis, and now are finding themselves forced to go to wholesalers and jobbers for goods with which to meet the public demand.

There still is a good deal of unemployment, but here, again, the situation is getting better. Reports of virtually all industrial commissions, including some of national importance and scope, show that the number of unemployed steadily is diminishing. In this respect, it is worthy of note that two of the greatest industrial corporations in the country, the United States Steel Corporation and the Bethlehem Steel Corporation, have announced programs of expansion which will give employment to thousands of men, and in making public these programs both Judge Gary and Charles M. Schwab have stated their belief that by starting their expansions now they will not only be helping the situation, but also will be helping themselves and their companies by utilizing the surplus labor now available. It is their stated belief that within a short time there will be no surplus labor supplies. Mr. Schwab further gave utterance to the opinion that the country is on the threshold of a tremendous boom.

Ratification of the Peace Treaty with Germany opens up a new demand for American goods, for with peace restored with Germany it is probable that bankers shortly will arrange very considerable credits here for that country which will allow of a full resumption of trade relations.

A successful outcome of the Disarmament Conference can have only one result. If armaments are to be reduced, the great nations of Europe will be relieved of the awful burden under which they have been struggling for years and, because of this, vast quantities of capital will be released for industrial purposes. Further, with the reduction of armaments and the making more remote of war, international credit will be helped, relations between nations will be improved and the way will be opened for the extension of American credit to European countries. In this way Europeans will be enabled to come here and purchase the goods which they so badly need and which we are so anxious to sell.

The quashing of the threatened railroad strike is an event of far greater significance than generally is recognized. It not only means that a national catastrophe has been averted, but it shows that the agencies of Government are not to be defied by any individual group, and, incidentally, public opinion made itself plain to the effect that it will not tolerate the losses and inconveniences which, in the past, have resulted by the arbitrary action of a minority of the people. With the threatened railroad strike obviated in the manner in which it was, we are not likely to be confronted with another such crisis for some time to come.

We may not be on the verge of another great boom, such as we had two years ago, and perhaps Mr. Schwab and some others are too optimistic. But it does certainly appear that we have seen the worst, and that from now on we are to enjoy much better and much more stable business than we have been having for the past year.

Commercial Telegraphers' Union of America

The Eighth Biennial Convention of the Commercial Telegraphers' Union of America met at the Prince George Hotel, Toronto, Ont., October 3rd. with about three hundred delegates present. Much business of importance was transacted and an elaborate program of entertainment was carried out.

The following officers were selected for the ensuing year: International president, Roscoe H. Johnson, Chicago (re-elected); vice-president, Paul F. Schnur, Chicago; vice-President, O. L. Newcomer, Chicago; vice-president, W. E. Conry, Boston; international secretary-treasurer, Frank B. Powers, Minneapolis, Minn.

Members General Executive Board—Joseph F. Mallon, chairman, Brooklyn, N. Y.; J. G. A. Decelles, Montreal, Que.; Alex S. Strachan, Toronto, Ont.; Robert F. Wise, St. Louis, Mo.; Charles J. Seefred, Indianapolis, Ind.; alternate to A. F. of L. convention, Percy Thomas, New York.

The next convention will take place at Montreal, Que.

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WESTERN UNION TELEGRAPH CO.

A CONFERENCE, the object of which is to insure the public a hundred per cent. efficiency service, took place in the office of Division Traffic Superintendent J. P. Edwards, at 24 Walker Street, November 9th.

The following officials were present: Chief operators, C. E. Shelley, Albany; L. D. Willburn, Baltimore; J. B. Rex, Boston; J. E. Jenkins, Buffalo; F. R. Webb, Philadelphia; J. A. Larimore, Pittsburgh; E. F. Dann, Rochester; J. M. Lighton, Syracuse; C. H. Dexter, Washington; Division Traffic Supervisors, W. G. Wetmore, Boston; W. J. Dodge, Pittsburgh; T. M. Haston, J. M. Creamer, C. C. Lever, H. D. Austin, New York; C. J. Elsden, chief clerk; L. L. Watkins, supervisor of operating practices, New York; S. B. Lomas, supervisor of the Bureau of Analysis and Statistics; W. T. Rogers, division wire chief; Division Traffic Inspectors, W. M. Scherman, R. F. Drahner, J. J. Griffin, J. R. Palmer, J. A. Thompson, all of New York.

The conference was presided over by Division Traffic Superintendent J. P. Edwards.

IN the November 1st issue brief mention was made of the death of Emory H. Falls, identified with the office of Vice-President G. W. E. Atkins, New York. Mr. Falls had been connected with the company for more than fifty-five years, having entered the service when the headquarters were located at Rochester, N. Y. Mr. Falls was the last surviving member of the original group that came from that city at the time the executive department of the company was transferred to New York City. Mr. Falls is survived by his wife and a daughter, who live at Westfield, N. J.

J. W. ATKINS, chief operator at Key West, Fla., has returned to duty after an absence due to illness.

L. W. GRIFFITH, chief operator at Roanoke, Va., has resigned and W. H. Cantrell of Knoxville, Tenn., has been appointed as his successor.

JAMES H. SHARON, manager of the Stockton, Cal., office from 1888 to 1917, has been retired on a pension.

J. A. BELL, assistant wire chief of the Columbia, S. C., office of this company, accompanied by his wife, recently spent two weeks in New York.

J. G. MCNERNY of the Buffalo, N. Y., office, accompanied by Mrs. McNerny, was a New York City visitor on October 28th.

Philadelphia

THE Hallowe'en party of the Electrical Aid Society held on Saturday evening, October 29th, at Mercantile Hall, was a most pleasing success. A feature of the evening was the installation of Morse sounders throughout the hall. That grand old man of the telegraph, I. D. Maize, upon entering the dance floor, was greeted by his baby brother, Frank E., at the key, with: "Hello, you 79-year-old youngster. '73,'" followed by President John A. Chapman and others, to which "I. D." replied with a firm grip of the key and in perfect Morse: "Greetings, fellows; many thanks! I can still put 'five on a line,' notwithstanding the approach to my eightieth birthday." The march was led by representatives of the Western Union, Postal Telegraph and American Telephone and Telegraph companies, and prizes awarded to the best and most comical dressed, by a committee selected from visitors from other cities.

OTIS J. THOMPSON, aged fifty-three years, identified with the Western Union Telegraph Company's service at Richmond, Va., since 1885, until a few years ago, when he was retired on pension, died on November 6th.

Death of John F. Wallick

John F. Wallick, aged ninety-one years, died at Indianapolis, Ind., on October 30th. Mr. Wallick retired from active telegraph service in 1911.

He was a Pennsylvanian by birth and entered the telegraph service at Wooster, Ohio, with the late General Thomas T. Eckert in 1850. He was appointed manager of the Indianapolis office in 1852. In 1864 he became superintendent at that point, and he continued to hold that position until his retirement in 1911, as previously stated.

Mr. Wallick aided in the development of the telephone in the larger cities of Indiana, and at the time of his retirement he enjoyed the distinction of having been in continuous service longer than any other superintendent in the Western Union Telegraph Company's service.

A. A. Brown, city superintendent of the Western Union Telegraph Company. stated that although Mr. Wallick had retired from active service many years ago, he remained until the time of his death a prominent part of the Western Union organization. Mr. Brown added: "He was near and dear to everyone identified with the service."

Mr. Wallick gave Thomas A. Edison a position as telegraph operator in the Indianapolis office in 1864.

Mr. Wallick suffered a general breakdown several weeks ago and had been seriously ill about ten days.

He is survived by seven children.

Radio Corporation of America

PRESIDENT E. J. Nally arrived from England on the steamer *Aquitania* on November 11th.

THE fall dinner of the Static Club was held at the Hotel Astor November 3rd, sixty-six members being present. General Manager David Sarnoff addressed the club, his subject being "The Future of Radio."

A. A. ISBELL, general superintendent of the Pacific Division, who has been in New York for a fortnight, left for home on November 8th.

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Canadian National Telegraphs

CHIEF Electrician H. K. Clark, and his installers, have just completed, in record time, the moving of the Hamilton, Ontario, office to the main floor of the *Spectator* Building, a few doors north of the old premises on James Street. The commercial and traffic departments are on the same floor, with a splendid layout with favorable working conditions.

A NEW power plant and a sixteen-wire, eight-position selector concentrator have recently been installed in the London, Ont., office. This equipment should greatly improve the efficiency of the service at that point.

THE commercial office at Hornepayne, Ontario, was officially opened in the new $100,000 Canadian Northern Railway depot at that point on October 21st, when a most successful dance and entertainment was given by the officials and employees of the railway. The new depot is of the latest design and construction, and stands a credit to the management. The telegraph plant is also of the newest type and attracted much attention. During the evening, Chief Operator Thompson, Thurston's rival, presented a very mystifying exhibition of magic, which thoroughly captured the assembled guests. The White House Orchestra of Port Arthur furnished splendid music for the dancers, and the ladies served a delightful buffet luncheon. The evening concluded after a sincere appreciation of the gathering had been extended to Superintendent J. J. Napier and others, who, by their untiring efforts, had been responsible for such a memorable event.

A. C. WILBUR, chief operator, Moncton, N. B., recently attended a conference of Western Union officials of the Eastern Division, at St. John, N. B.

THE employees of the Canadian National Telegraphs at Montreal held the first of this season's dances at the National Hall on October 6th.

GEO. T. TROWHILL, supervisor of wire service, recently made an inspection of the plant on western lines.

J. MCMILLAN, general manager, Canadian Pacific Railway Company's Telegraphs, left Montreal on October 2nd, on a trip of inspection through to the Pacific Coast, visiting each superintendent and stopping at each central point for general consideration of service, and special consideration of next year's requirements in the way of new work, and possible extensions of wire facilities where service is developing in new locations. He expresses himself as being much satisfied with the trip. The handling of telegrams was found to be very satisfactory, and general conditions on the line to be in good shape. In making the trip both westward and eastward he was accompanied by each superintendent over his own division, and also by Traffic Superintendent E. L. Scott of Western Lines, and J. Mitchell of Eastern Lines, and from Winnipeg to the Coast and return by Wm. Marshall, assistant manager, at Winnipeg.

OBITUARY

WILLIAM J. CARROLL, aged fifty-five years, one of the best known telegraph operators in New York, died on November 3rd at his key in the Bankers Trust Company office, 18 Wall Street, New York. He had started sending a message to a Western correspondent when he was seized with a heart attack.

Mr. Carroll was in charge of the day wire of the old Laffan News Bureau before it was taken over by the United Press Association; later he took charge of the cables at the *Sun* office, and for a time was night manager of the Herald-Sun Syndicate.

EDWARD C. COOKE, aged sixty-nine years, for over thirty years identified with the Associated Press at Pawtucket, R. I., but for the past two years retired on pension, died on October 14th. Mr. Cooke was identified with the New York office of the Western Union Telegraph Company in the late seventies and earliy eighties.

W. E. DULIN, aged eighty-three years, a former old-time telegrapher, but for the past fifty years a member of the Pension Office staff at Washington, D. C., died on November 1st. The remains were interred in the Congressional Cemetery.

WILLIAM G. CHITTENDEN, aged fifty years, of the Canadian Pacific Railway Company, Vancouver, B. C., died on October 9th.

J. H. MCGUIRE, Western Union and broker telegrapher in Chicago, identified with these interests for the past thirty-five years, died on October 31st.

Don't Advertise—Save Your Money

Don't advertise if you believe you are wasting money. Let your competitor waste his money on advertising, and perhaps in this way you will put him out of business. Fix his clock for him. Just stand back and laugh at him when you see him squandering his money for ink. Once there was a boy named John; we believe it was Wanamaker. Maybe it was Moneymaker. Anyhow, it was John, with some sort of a maker attached to his last name. He owned fifty yards of calico, three pairs of jean pants, half a dozen pairs of good home-made socks and five pairs of boots. He called this a dry goods store through a Philadelphia newspaper and offered to sell a pair of socks for 39 cents. The didn't-believe-in-advertising merchant laughed. Young John spent $65 with the *Philadelphia Ledger* to advertise just one time and had less than $100 worth of goods. He was cautioned by the merchant who "knew it didn't pay." It was from "sympathy," they said, "for his poor mother that they offered advice." But John didn't listen to them, and went and blew his money foolishly, and today John sees the result of his misdoings. He has so many large dry goods stores that he can hardly find time to study his Sunday school lessons.—*Safety Harbor Herald.*

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Entertainment of the New York Telegraphers' Aid Society

The officers of the New York Telegraphers' Aid Society are busily engaged in planning to make the Entertainment and Reception this year one of the best ever given by the Society. It will take place at Palm Garden, 58th Street, between Lexington and Third Avenues, New York, on Friday evening, December 2nd.

This will be the forty-first annual entertainment in behalf of the Relief Fund. The net proceeds of these entertainments is devoted exclusively to those of the fraternity who may be in distress and who for any reason may be ineligible for membership in the Society.

The officers of the Society are: President, C. J. Lemaire; vice-president, J. J. Keefe; treasurer, Thos. M. Brennan; financial secretary, C. A. Kilfoyle, and recording secretary, Mary E. Saunders.

The entertainment will be in charge of R. J. Marrin, chairman, and Walter Redlefsen and J. P. Clolery, vice-chairmen. Admission, 50 cents; reserved seats, 75 cents, and box seats, $1.

Remittances should be made to C. A. Kilfoyle, financial secretary, P. O. Box 711, City Hall Station, New York, or William J. Quinn, Room 1229, 24 Walker Street, New York.

Statement for the Year Ending March 6th, 1921

Balance on hand March 6th, 1920		$23,057.06
Receipts:		
From Dues	$4,027.30	
From Initiation Fees	62.00	
From Interest	1,039.57	
From Payment on Mtge.	250.00	5,378.87
Total		$28,435.93
Disbursements:		
Sick Benefits	$3,252.00	
Death Benefits	1,100.00	
Expenses	837.07	5,190.07
Balance on hand March 6th, 1921		23,245.86
Total		$28,435.93

RELIEF FUND

Balance on hand March 6th, 1920	$7,032.01
Receipts	791.06
Total	$7,823.07
Disbursements	$ 396.50
Balance on hand March 6th, 1921	7,264.57
Total	$7,823.07

Balances

Aid Society	$23,245.86
Relief Fund	7,426.57
Total	$30,672.43

Assets

Mortgage	$ 7,500.00
Bonds	12,974.92
On Deposit	10,197.51
Total	$30,672.43

All America Cables

W. J. O'BRIEN has been appointed manager of the operating room of the main office at 89 Broad Street, New York.

J. H. FORSYTH has been appointed senior supervisor, New York.

E. LAFAN has been appointed acting manager at Santa Elena, Ecuador.

D. ALLISON has been transferred from Lopaz, Bolivia, to Paita, Peru.

H. D. HARVEY and J. G. Boston, junior operators, have sailed from New York for Balboa, Canal Zone, where they will be stationed.

J. F. WILSON of Santos, Brazil, has been retired on pension, and has left with his wife for Liverpool, England, his old home.

A. F. WEBSTER, formerly manager at Galveston, has been retired, effective November 1st.

A New Telegraph and Telephone Reference Book

The Electrical Trade Publishing Company, of Chicago, has issued a new book entitled "E. M. F. Electrical Year Book," which contains a large amount of interesting and valuable information on practically all phases of electrical development. There are over 800 pages, 9 x 12 inches.

The contents are arranged in alphabetical order and include definitions of electrical terms, names of electrical inventors, data relative to company organizations. Also, practically every electrical device manufactured in this country and Canada is described, and a list of the manufacturers of each article is given.

The large amount of matter included in the book on the subjects of telegraphs and submarine cables was prepared by Donald McNicol, former editor of TELEGRAPH AND TELEPHONE AGE.

The work forms a complete cyclopedia of electrical information for engineers, purchasing agents, electrical jobbers and company officials.

Copies may be obtained from TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York, at the sale price, $10.00 per copy.—Advertisement.

A. J. COPPIN, of the cable office of the Western Union Telegraph Company, Halifax, N. S., in renewing his subscription for another year, has this to say: "As the years come and go, your journal continues to improve. I feel more than ever the conviction that TELEGRAPH AND TELEPHONE AGE is indispensable to everyone connected with the telegraph service. It not only enables one to keep in touch with associates, past and present, but it is a means of keeping informed as to the development of electrical science as applied particularly to telegraphy. To be fair to himself, every telegrapher should be a subscriber."

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Another Western Union Telegraph Company

Following the incorporation on October 22nd, under the laws of Wyoming, of the Western Union Telegraph Company, capitalized at $10,000 and formed for the purpose, as stated in the articles, of operating a wireless business in the State of Wyoming, officials of the company bearing the same name and doing a nation-wide business, on October 26th protested with vigor, but without avail.

A hearing before Secretary of State William E. Chaplin, with the others present, including District Commercial Superintendent E. E. McClintock of Denver, Manager J. R. Hill of Cheyenne and H. M. Symonds, deputy secretary of State, developed this situation:

The original Western Union Telegraph Company has never complied with the Wyoming law requiring all foreign corporations doing business in the State to file their articles of incorporation with the Secretary of State. With its capitalization running into many millions, the filing fee probably would have been in the neighborhood of $2,000. The United States Supreme Court had held that corporations doing an interstate business were exempt from compliance with such incorporation laws as are on the Wyoming statute books.

The telegraph officials served notice that the Western Union would take court action, if necessary, to protect itself against the invasion of the youthful intruder.

Some time ago the company attempted to file a certificate showing J. R. Hill to be its local agent, but the Secretary of State refused to accept it, taking the position that the Western Union had no legal existence in Wyoming, and that before a corporation may officially designate a Wyoming agent it must file its articles of incorporation.

On October 22nd there was received at the office of the Secretary of State papers asking that the Western Union Telegraph Company be duly incorporated in Wyoming. These papers showed that Francis V. Hertzig, Thew J. Ice and Arthur J. Baldwin, all of Powell, Park County, Wyo., were to be the incorporators, that $10,000 was to be the amount of the capital stock, and that the main object of the new concern was to be "the construction, acquisition—by purchase or otherwise—maintenance and operation of wireless magnetic telegraph stations in the State of Wyoming, and the sale or other disposition of any or all of such wireless magnetic telegraph stations from time to time."

The 1920 Wyoming State directory lists A. J. Baldwin of Powell as a chiropractor. The name of Ice is not given, but he is said to be a doctor. Hertzig is an attorney.

Miss Anne O'Connell, filing clerk at the Secretary of State's office, accepted the papers and the filing fee, and the incorporation was duly made. In this action she was later backed up by Deputy Symonds and Secretary Chaplin. Mr. Chaplin immediately, however, notified officials of the original Western Union Telegraph Company that another concern by that name had been organized in Wyoming.

Messrs. Chaplin and Symonds took the position at this conference that the latest filing was not in confiict with that of any other company, since the name of Western Union Telegraph Company had never been listd previously in the office records. Their work, they maintained, is ministerial rather than judicial; whenever incorporation papers, legally drawn up and accompanied by the proper fees, and with a corporate name not conflicting with any previously filed, are received by them it is their duty under the Wyoming law to accept them.

Messrs. McClintock and Hill are said to have argued that their company should have been notified, and therefore allowed to protest, before the papers were accepted. Had this been done, they said, the original Western Union could have protected its trade name in Wyoming by filing its incorporation articles.

As the matter now stands, one Western Union Telegraph Company is doing a big business in Wyoming, but has no legal status, while another Western Union Telegraph Company, with limited backing and with only $10,000 in capital, has been given official sanction, at least insofar as its incorporation is concerned, and is threatening to make officials of the elder concern lie awake many nights in a desperate effort to find ways and means of getting rid of the unwelcome guest. One way may be found in the fact that the intruder must show its good faith by starting actual operations within six months. State House people conversant with the situation are inclined to doubt that this will be done.

Appealing to Voters by Radio

Many of the candidates in the November election addressed their constituents by radiotelegraphy without leaving their homes. The broadcasting of speeches in this way resulted in many thousands of voters hearing what the candidates had to say under more favorable conditions than was heretofore possible.

Amateur Radio Operators of New York State Organized

Amateur Radio Operators of New York State to the number of 500 met at the Iroquois Hotel, Buffalo, N. Y., on October 28th and 29th and effected an organization to be known as the Amateur Radio Operators of New York State.

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Telegraph and Telephone Age

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No. 23 NEW YORK, DECEMBER 1, 1921 Thirty-ninth Year

CONTENTS

Special Service Trunking. By Harry E. Hershey of the Automatic Electric Company, Chicago. (Concluded from Page 518, November 16th Issue) 534

Revision of Some of the Electromagnetic Laws. By Carl Hering..... 535

Wireless Telegraphy Discovered and Successfully Demonstrated by an American Before Marconi Was Born. By Chas. E. Weller, La Porte, Indiana 537

Major Cecil W. Mackenzie 538

Ladders to Climb. By Clarence H. Mackay..... 539

All America Cables. Submarine Cable Developments in Italy..... 540

Telephone Battery Charging Methods With Tungar Rectifiers..... 541

Sir Charles Bright and Partners. International Telegraphic Conference in Riga. The Late Geo. F. Milliken. The Louisville and Nashville Railroad Right of Way. Inter City Radio Company Beats Hoover in Air Case 543

Student's Course in Technical Telegraphy. By Louis Casper. Lesson 40 544

Editorial—Another Western Union Telegraph Company..... 546

The Railroad—Railway Operation in Belgium. Some Phases of Railroad Telegraph and Telephone Engineering. By Stanley Rhoads, New York 549

A Reply to J. Brown of Beaver Dam, Ohio. Communication Engineers Have Meeting 552

Personal. Postal Telegraph-Cable Company 553

Western Union Telegraph Company 554

Radio Corporation of America 555

Electric Batteries Reverse Voltage at Low Temperatures. Telephonic Device to Record Sound of Breath and Heart..... 556

Canadian. Canadian National Telegraphs 557

The Telegrapher's Opportunity. By P. J. Tierney. Obituary. New Mediterranean Cable.. Deep Sea Diving. By the Walrus..... 558

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Special Service Trunking

By HARRY E. HERSHEY,
Of the Automatic Electric Co., Chicago

(*Concluded from page* 518, *November* 16*th Issue*)

In a single office automatic plant the special service features, Long Distance, Complaint, Information, etc., introduce no particular complications. In a multi-office system, however, this service becomes quite complicated and it is essential that all the switchmen in every office thoroughly understand the scheme as employed in their particular network.

At the right in Fig. 34, is represented a main office in which is located the trouble, information and test desks. Just below is represented a toll office, it being assumed that the toll board is housed in the same building as one of the branch offices. At the left of the figure is represented a local office which may be considered as any office in the network with the exception of Main and Toll.

In the local office a primary and secondary line switch are shown as having access to a first selector. The second level in the banks of the first selectors leads to repeaters which are attached to trunks terminating on incoming second selectors at Main. The eighth level in the banks of the first selectors leads to repeaters which are attached to trunks terminating on incoming second selectors at Toll. The first level in the banks of the first selectors leads to special second selectors in the local office.

The second, third, fourth and sixth levels in the banks of the special second selectors are multipled together, and are also multipled with the second level in the banks of the first selectors. The first level in the banks of the special second selectors leads to the local Wire Chief's desk. The eighth level in the banks of the special second selectors leads to the reverting call switches. The ninth level in the banks of the special second selectors leads to the Fire and Police repeaters.

The tenth level in the banks of the incoming second selectors at Main leads to special third selectors. The second level in the banks of the special third selectors leads to the Information desk. The third level in the banks of the special third selectors leads to the Complaint desk. The fourth level in the banks of the special third selectors leads to the Time desk. The sixth level in the banks of the special third selectors leads to the Test desk.

The tenth level in the banks of the incoming second selectors at Toll leads to the Toll Recording switchboard.

To call Information 1202. Primary line switch, secondary line switch and first selector. Call 1 on first selector and seize special second selector. Call 2 on special second selector and seize repeater associated with regular trunk which terminates on an incoming second selector at Main. Call 0 on incoming second selector at Main and seize special third selector. Call 2 on special third selector and seize trunk to Information desk.

To call Complaint 1303. Primary line switch, secondary line switch and first selector. Call 1 on first selector and seize special second selector. Call 2 on special second selector and seize repeater associated with regular trunk which terminates on incoming second selector at Toll. Call 0 on incoming second selector at Main and seize special third selector. Call 3 on special third selector and seize trunk to Complaint desk.

To call Time 1404. Primary line switch, secondary line switch and first selector. Call 1 on first selector and seize special second selector. Call 4 on special second selector and seize repeater associated with regular trunk which terminates on an incoming second selector at Main. Call 0 on incoming second selector at Main and seize special third selector. Call 4 on special third selector and seize trunk to the Time desk.

To call the Test Desk 1606. Primary line switch, secondary line switch and first selector. Call 1 on first selector and seize special second selector. Call 6 on special second selector and seize repeater associated with regular trunk which terminates on an incoming second selector at Main. Call 0 on incoming second selector at Main and seize special third selector. Call 6 on special third selector and seize trunk to Test Desk. It will be seen that the tester cannot test back over a 1606 trunk, when the calling trouble man is in a distant exchange, for the reason that there is a repeater in the circuit. In order to test under these conditions it will be necessary for the tester to set up the connection on a test distributor. If the trouble man is working out of Main he can call 1606 and get a test immediately, for under these conditions there will be no repeater in the circuit.

To call Long Distance 100. Primary line switch, secondary line switch and first selector. Call 1 on first selector and seize special second selector. Call 0 on special second selector and seize repeater associated with regular trunk which terminates on an incoming second selector at Toll. Call 0 on incoming second selector at Toll and seize trunk to the Toll Recording switchboard.

To call Fire or Police 19. Primary line switch, secondary line switch and first selector. Call 1 on first selector and seize special second selector. Call 9 on special second selector and seize Fire repeater. This fire repeater will extend the connection to an attendant at Main who can further extend the call to the Fire or Police Department, as desired. The fire repeater also locks up the connection and furthermore sounds an audible alarm. The attendant in the local office then traces the connection and makes a memorandum of the number of the calling telephone, after which he trips the repeater, allowing the connection to release.

To call the Reverting Call Switch 18. Primary line switch, secondary line switch and first selector. Call 1 on first selector and seize special second selector. Call 8 on special second selector and seize Reverting Call Switch. See Fig. 34.

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Emergency Call 11. Primary line switch, secondary line switch and first selector. Call 1 on first selector and seize special second selector. Call 1 on special second selector and seize trunk to local Wire Chief's desk.

The great advantage in this scheme is that the special service calls are routed over the regular inter-office trunks. If this were not done there would be required a group of special service trunks from each office into Main, and a group of recording trunks from each office into Toll.

Since the second, third, fourth and sixth levels in the banks of the special second selectors are multipled with the second level in the banks of the first selectors, it is evident that the Information desk may be reached by dialing any of the following numbers, 1202, 1302, 1402 or 1602. A more simple scheme is that in which only the second level are operated, after which the first two figures of a special service call will cause that call to come into the local Wire Chief's desk at the proper position. The last two figures in the special service call will, of course, be lost.

The majority of operating companies favor a scheme by which double number complaints are completed by the complaint operator. The complaint desk is equipped with a number of outgoing trunks, and if A reports that he cannot call B the complaint operator will complete the connection, allowing A and B to carry on their conversation through the board. If the called line tests busy the complaint operator can cut across that line, by means of test distributor trunk, and ascertain if the line is in use or in trouble.

Toll Trunking

The outgoing trunks from the Toll board are

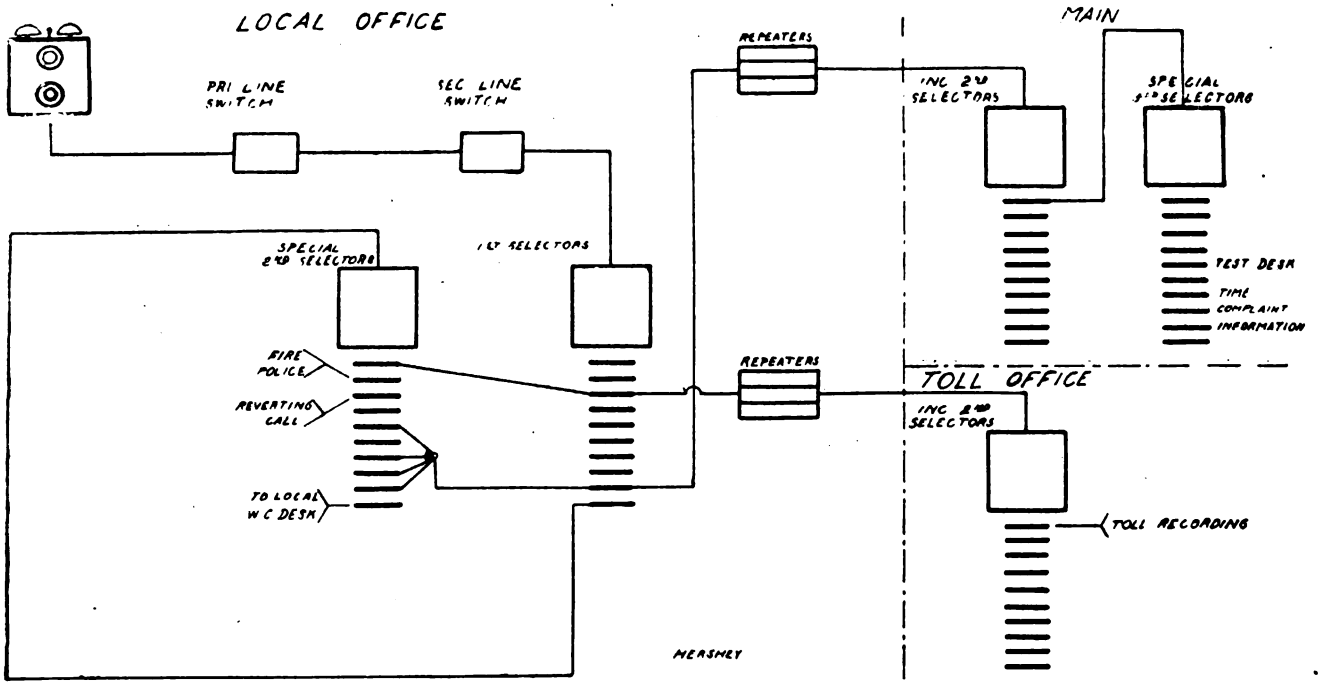

Fig. 34. Special Service Trunking

in the banks of the special second selectors is multipled with the second level in the banks of the first selectors. The call numbers for special service now become Information 1202, Complaint 1203, Time 1204 and Test 1206. The latter scheme would be satisfactory if it were not for the fact that it is desirable to be able to answer special service calls in the local office should an emergency arise.

The special service trunks between the banks of the special second selectors and the banks of the first selectors are usually looped through the local Wire Chief's desk in such a way, that, with the associated keys at normal the calls go through as shown in Fig. 34. When it is desired to "head off" the special service calls in the local office the keys

usually special open wire trunks direct to each office. These trunks terminate on Toll second selectors, which in turn have access to the Toll third selectors in that office. The Toll third selectors have access to the Toll connectors, there usually being one of the latter for each one hundred line board. The Toll selectors and connectors are similar to the ordinary selector and connector, the important difference being that the ringing is under the control of the Toll operator.

Since the Toll operator picks the office, as she plugs into the trunk jack, she must disregard the first figure of the number when operating the dial.

The Toll board is also equipped with a number of "overflow" trunks, which terminate on line switches in the Toll office. If the Toll connector in

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a certain hundred is busy, and it is desired to call another number in that hundred, it will be necessary for the Toll operator to use an overflow trunk and put up the connection by dialing the directory number. The transmission on the overflow trunks will naturally be inferior to that on the regular Toll trunks.

The scheme outlined in the above paragraph is objectionable in that the local connectors are not adapted for toll service and the toll connectors cannot be used for local service. A more recent development is to provide combined Toll and Regular connectors. These switches when seized by a subscriber have all the functions commonly associated with an automatic connector, but when seized by a toll third selector, these same switches transform themselves into a toll connector and give a standard toll talking circuit to the called party.

The combined switch is rather costly and an ingenious scheme has been worked out whereby the first five choices from the local board are Regular connectors, the following five choices are combined Toll and Regular. Then, of course, the choice reverse to the toll board, allowing the combined switches to be seized first.

In toll work it is imperative that the recording operator have some means of gaining information relative to the status of a subscriber asking for a toll connection. This is accomplished by associating with each line a tone indicating the toll service which it may receive.

Revision of Some of the Electromagnetic Laws

By Carl Hering

Carl Hering, well known in electrical circles, in a lengthy article printed in the November 1st issue of the *Journal of the Franklin Institute*, Philadelphia, under the above named title has this to say in the initial chapter:

The present celebration of the centennial of the important and fundamental research work of those great pioneers, Ampere and Oersted, is an appropriate occasion to note some of the new phenomena or laws, if any, which may have been found and pointed out in recent times, and more especially to examine more critically the laws of such phenomena as commonly stated in text-books and taught in schools and colleges, to see whether they are still universal laws as far as we now know, or whether any modifications are necessary or desirable in order to make them include modern developments or to make them clearer to the student and more easily understood by him.

When a law is a universal one it means that there are no exceptions, hence, if there are exceptions it is not a universal law, and its limitations should then be clearly stated or a new law should be framed which is really universal. If a law is really universal it is possible to maintain with certainty that a proposed device or process which violates it, cannot possibly operate; a proposed perpetual motion is an illustration. If, however, a law is not a universal one, though incorrectly so considered, a proposed new device or process might be unjustly condemned as inoperative, thereby preventing progress in new, untried fields. The writer has met with such cases, in one of which a very useful and well-known law, which was considered to be a universal one, was found to call for a result contrary to the facts; the prediction that a certain new device based on this law would operate was therefore found to be wrong. To teach that a law is universal when it has been shown that it is not, is in the writer's opinion an educational crime, specially against the rising generation which is depended upon to develop new and untrodden fields. If a law is really universal it must apply to all future cases. If we know of no exceptions it is excusable, but after exceptions have been found there is no excuse for continuing to maintain that the law is universal.

Moreover, if a law is shown to be incorrectly worded it should be revised so as to be correct. In the writer's opinion this is the physicist's duty to the students he is instructing. In a certain case in the writer's experience a well-known law was relied upon as being correctly stated, and much money and time were spent on a device which would have operated had this law been stated correctly, but the device failed completely due to the law having been incorrectly worded.

In another case the laws in text-books were interpreted by physicists to strenuously deny the existence of certain forces, but the writer found that the results of the actions of such forces existed in practice, and therefore required an explanation for their existence. An adherent of the older law made an attempt to explain the result by the aid of hydraulic forces, but the writer believes it can be shown that the text-book law originally relied upon, or as generally interpreted, is not sufficiently comprehensive in scope, and that a new and broader law can and should be framed which applies correctly to all observed facts, and shows that the forces heretofore denied, really exist.

But even if it is possible to explain the existence of some new observed facts in a round-about, cumbersome, complicated way by means of the older laws of our grandfathers, the writer maintains that it is our duty to the student and to the investigator in new and untrodden fields who is relied upon for new developments, to teach him simpler and broader laws which apply more directly, if such new laws can be framed and are correct.

Get the Saving Habit

There is nothing more important than to save part of your income and invest it safely. This provides against life's two greatest misfortunes—sickness and old age. Therefore, get the saving habit. It will also help you to buy the most valuable possession in the world—your own home.—*Robt. H. Ingersoll.*

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Wireless Telegraphy Discovered and Successfully Demonstrated by an American Before Marconi Was Born

By CHAS. E. WELLER, LaPorte, Ind.

Your readers will be interested in learning that wireless telegraphy was discovered and successfully demonstrated by an American, Dr. Mahlon Loomis, a dentist of Washington, D. C., six years before Marconi was born. Dr. Loomis named his invention "aerial telegraphy." His first public demonstration was made in 1866 between two peaks of the Blue Ridge Mountains, 4,000 feet above sea level, in Virginia, where he thoroughly demonstrated the fact that telegraphing could be carried on as readily without as with connecting wires. His second demonstration was in Chesapeake Bay, where he was successful in communicating without wires between two vessels stationed two miles apart. This was thirty-one years before Marconi gained his world-wide reputation by sending a wireless communication between Great Britain and France across the English Channel.

In 1869 Dr. Loomis succeeded in interesting a number of Boston capitalists, who agreed to advance the necessary funds for placing his discovery on a commercial basis, which would undoubtedly have led to complete financial success, but for the lamentable fact that just about that time there suddenly sprang up in Wall Street the most serious panic ever known in this country, culminating in the historical "Black Friday," in which fortunes were lost in a few short hours, and Dr. Loomis' backers who were caught in the midst of the vortex lost every dollar that they possessed.

Still undaunted by this crushing blow, Dr. Loomis persisted in his efforts to secure financial backing, and having earned sufficient means from his dental practice to enable him to make a trip to Chicago, he proceeded to lay plans for exploiting his wonderful discovery before a moneyed syndicate of the Windy City, and finally succeeded in obtaining a promise of sufficient means to finance him in his undertaking; but here again his unlucky star followed him, in the great fire of 1871 which destroyed the city, and swept away the entire fortune of his backers, together with thousands of others who inside of forty-eight hours were reduced from affluence to poverty, and once more Dr. Loomis' hopes were dashed to the ground.

In the meantime Dr. Loomis had not been idle in pushing his plans in other directions, one of which was to secure the aid of the government in what today would be called an infinitesimal appropriation of $50,000 to enable him to fully demonstrate the value of his wonderful discovery. His location at the capital of the nation enabled him to get in touch with our Senators and Representatives in Congress, and in 1869 he succeeded in persuading Senator Charles Sumner to introduce a bill incorporating "The Loomis Aerial Telegraph Company." Mr. Sumner evidently had little or no faith in the value of Dr. Loomis' discovery, as indicated by his remarks prefacing the introduction of the bill, in which he stated that Dr. Loomis' claim was "either all moonshine, or if genuine it marked a great epoch in the progress of invention," and without expressing a decided opinion one way or the other he simply requested that the bill be referred to the Committee on Patents.

An interval of three years elapsed, during which Dr. Loomis' bill was slowly working through Congress until the spring of 1872, when it was taken up in the House of Representatives and discussed at some length, principally by Congressman Conger of Michigan, who had made a careful study of Dr. Loomis' discovery, which he explained in detail to his colleagues, and the bill was finally passed and signed by President Grant, but unfortunately its most important feature, requesting the appropriation of $50,000, was overlooked. and the corporation was unable to function for lack of funds.

In the meantime the daily press of the country took up the subject and our unfortunate inventor was subjected to a tirade of criticism and ridicule, prominent among which was a diatribe by the New York *World,* in which the editor after the most approved fashion proceeding to everlastingly lambaste Congress for having spent the smallest modicum of its precious time in discussing the ridiculous proposition of Dr. Loomis.

Dr. Loomis obtained a patent for his invention in 1872, two years before the birth of Marconi, who was born in Bologna, Italy, on April 25, 1874.

A late issue of the Washington *National Republican* contains a portrait and a detailed account of Dr. Loomis' discovery in wireless telegraphy and his successful demonstrations in the two cases mentioned and the difficulties which beset his path in attempting to secure financial assistance to enable him to perfect his invention, and fully demonstrate its value to the government and people of the United States.

Dr. Loomis died in 1886. A careful examination of the encyclopedias, including the Century Book of Names, containing many thousands of those who have attained the slightest distinction in the world's history, reveals the fact that Dr. Loomis' name is not mentioned, with one solitary exception of the Encyclopedia Brittanica, which in an exhaustive treatment of the subject of wireless telegraphy, covering twenty-four columns, mainly devoted to Marconi and his wonderful discovery, makes a bare mention of "many other imperfect devices, such as one by Mahlon Loomis, put forward in 1872, which was not within the regions of realizable schemes."

Dr. Loomis went down to his grave "unwept, unhonored and unsung." If he had succeeded in obtaining sufficient funds to enable him to thoroughly demonstrate the practical value of his wonderful discovery, the chances are that we would never have heard of Guglielmo Marconi, while the name of Mahlon Loomis would have been known throughout the civilized world as the original inventor of wireless telegraphy, and at another and

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most prominent star would have been added to the bright galaxy of American inventors of the Nineteenth century.

[The author of this article, Charles E. Weller, was born near Marshall, Michigan, October 3rd, 1840. He was a telegraph messenger in 1848 at Marshall, Michigan, where his brother Alfred was an operator. He became a telegrapher in 1853 at LaPorte, Ind. For the following three years, he opened telegraph offices on the Michigan Southern and Northern Indiana Railroad between Toledo and Chicago. He entered the service of the Western Union Telegraph Company in 1856 at Milwaukee, where his brother Alfred was then manager. During the Civil War Mr. Weller was manager of the Madison, Wis., office. He was afterwards for several years chief operator at Milwaukee, when he moved to St. Louis, where he was superintendent of the police and fire alarm telegraph system. For the following forty years he was a court stenographer in St. Louis. For the past six years Mr. Weller has held the office of secretary of the National Shorthand Reporters' Association, with headquarters at LaPorte, Ind.—EDITOR.]

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Operators Occasionally Have Exciting Times

We are informed by the Eureka Springs, Ark., *Times-Echo* that J. H. Weisberger, a telegraph operator, while touring the country in an automobile recently had an exciting experience with a red racer snake. The snake, which was five and a half feet long, crawled under the car after having bitten into the tire. The car was stopped, but no trace of the snake could be found. Eventually it was discovered in the battery box, only to be lost again in the mechanism of the machine. When finally located in the dust pan it was killed.

Affidavits confirm the length of the snake. Some authorities state that the snake was three inches in diameter and was inclined to be vicious. Telegraph operators are no less subject to meeting snakes on the roadways than are any other members of the various professions. It is all a matter of ohm's law. If I is multiplied by R and divided by C it equals 23. The current of electricity that the snake has generated will be negative. Otherwise it will be positive. Mr. Weisberger has not yet issued a statement as to this particular snake, and it is difficult, in the absence of such a document, for the electrical engineers to properly analyze the circumstances under which the reptile was met and subdued.

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W. P. S. HAWK, superintendent of the Radio Corporation of America, Honolulu, Hawaii, writes under date of November 1st: "Although the company has adopted the policy of furnishing all offices with a copy of the AGE, I believe I would feel somewhat lost without my individual paper, as I obtain considerable pleasure in seeing old time faces and old time names in its columns."

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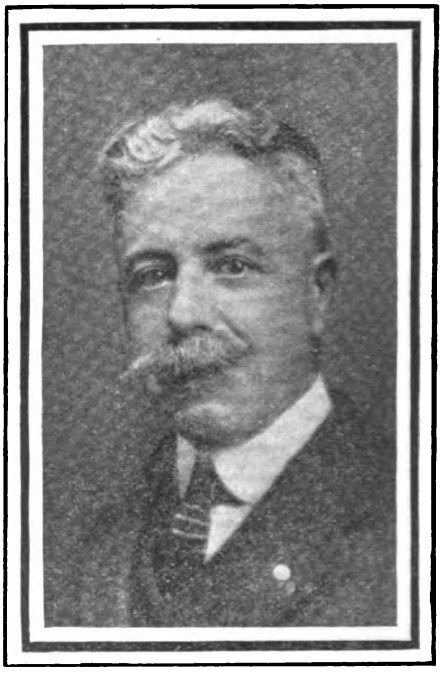
Major Cecil W. Mackenzie

One of the prominent figures at all of the conventions of the Telephone Pioneers of America is Cecil W. Mackenzie, identified with the telephone service at Buffalo, N. Y., since 1879, now retired from active business and living at Fort Erie, Ontario.

Mr. Mackenzie has endeared himself to all Pioneers, because of his interesting "write-ups" of the conventions, which he has duplicated and distributed among the membership at large. His story of the St. Louis Convention of the Telephone Pioneers, which occurred on October 24th and 25th of this year, which he permitted us to read in advance of its circulation, consisted of forty-six pages of interesting details descriptive of the trip from the moment he embarked on the special train at Buffalo, until his return to that city. Mr. Mackenzie is also well known in telegraph circles, having during his long business career been brought into contact with telegraph officials in the discharge of his various telephone and other duties.



MAJOR CECIL W. MACKENZIE

Mr. Mackenzie was born at Newport, Ky., on September 18th, 1861, but that is not the reason of his military title, as he was for many years an officer in the 65th Regiment, National Guard.

Since his entry into the telephone service in 1879 he has filled the positions of operator, manager of exchange, chief inspector, compiler of telephone directory, foreman of equipment and rights of way.

His numerous friends wish him a long and happy life in his retirement from business. Mr. Mackenzie will devote his future to literary pursuits and country life.

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Ladders to Climb—"The Secret of Success is that it is Not a Secret, But Character and Energy Combined With Ability"

By Clarence H. Mackay

I cannot better answer the question as to my attitude toward the ambition of young men who seek to climb the ladder of success than to say that in the organization of which I have the honor to be president, with but two or three exceptions, every one of the executives are men who have come up from the ranks. They have won their present positions by sheer ability; by the application of a combination of hard work and intelligence. They have received no favors which have not been accorded to all others. They neither have asked for, nor expected advantages over their fellow workers, and if they have outstripped them, they have done so by their own efforts.

As these men pass on, other men will come up to take their places. These latter will be the young men of today, who now are occupying the minor positions, and who, through their own efforts and ours, are being prepared for the responsibilities which they will have to carry later.

During the nearly forty years' existence of the Postal Telegraph-Commercial Cable System it has been our consistent policy to fill vacancies at the top by moving our men up, and all large corporations are coming more and more to this policy. And it is not more from choice than from necessity that this is so. Big Business, looked at askance by so many as a throttler of the individual, could not hold down the young man if it wanted to. If it tried, it would destroy itself. The young man, temporarily held back, would come on again and recreate Big Business for himself. Big Business knows this and is doing its utmost to help, rather than to hinder, the able and ambitious young man.

In these days of gigantic enterprise, ability of a high order is needed to manage affairs, and this ability may only be developed by hard work and intensive training, plus the student's faculty for absorbing the lessons of experience. There are no short cuts; no royal road. The poor boy of today, if he has the brains, the stamina and the desire to succeed, and, above all, the character that stabilizes these virtues, has, I believe, more chances for success than had the poor boy of any other generation. Everything is on such an enlarged scale. The $10,000 man of twenty years ago is the $50,000 man of today.

Opportunities Galore

The president of a bank, or a railroad, or of a great industrial corporation, has far greater power and opportunities and a much bigger job than he who held a corresponding position in an earlier generation. He who holds the position tomorrow will, in turn, have a still bigger job.

There is no lack of opportunity. For the American youth an epoch appears to be opening which promises more than was ever promised American youth before. The tremendous change in the world affairs brought about by the war has placed the United States in the very forefront of the world's great nations. In 1914 we were a debtor country and, despite our wealth and our boasts, were more or less provincial and we were not the world's leader, whether we cared to admit it or not. Now, in seven year's time we have become without the slightest doubt the greatest leader the world has ever known.

For the past year or so we have been going through a season of depression, or reaction following the terrific spurt of the war years. But we should not allow this to befog our vision of the true possibilities presented to our country. We are the world's leader, with opportunities for even greater leadership, and as the country is presented with opportunity, so is the individual citizen, and of all our citizens, our young men, with their strength and with their lives before them, are most favorably situated.

It was America which created Big Business. The new America with the enormously increased power it has attained during the past seven years, will create Super Business, and this means but one thing: Greater opportunity than ever before.

We are fond of saying that this is the day of the specialist. By this we mean the man of extraordinary and highly concentrated training. Well, then, if today the specialist is receiving great reward, what, may I ask, will be the reward of the specialist of tomorrow? It must surely be a greater reward, for the reward always is in proportion to the achievement, and the achievement of tomorrow should, in fact, must, exceed the achievement of today and of all days past. I would advise the young man of today to specialize, to select the business he desires to enter and concentrate his study on a particular phase of that business.

We have better schools today than we had in the past. Our ideas of education have expanded. No longer do we confine education to the public schools and to infancy. Business, industrial and agricultural colleges open to day and night students dot the land. All this will be carried on to still greater length, so that the young man coming into business now, and he who comes in later, will be offered more, and yet more, opportunity. I know that the war, in its immediate aftermath, appears to have affected, adversely, the prospects of the generation that physically fought and won the war. But viewing the future from the vantage point of economic history, from what may be termed the viewpoint of big business, there can be no question that we are on the upgrade from temporary depression. And of one thing I am sure, that the avenues of training open to young men who seek to make their mark in the coming era of prosperity, are far wider and far more numerous than those available to the young men of past generations.

What are the prospects of the young man of today? I should say that they are the best in the history of all time.—*Columbia.*

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All America Cables

R. A. PINIERO, of the Buenos Aires staff, died on October 29th.

J. L. WHALEY is acting manager at Barranco, Peru, during the absence of Manager Crowther on furlough.

C. A. DENEGRI took charge as acting manager at Lima, Peru, on November 1st.

J. T. SMITH, of Santa Elena, Ecuador, was married on November 3rd.

J. O. WISEMAN has sailed from New York for Fisherman's Point, Cuba, to assume the duties of manager at that place. Mr. Wiseman was accompanied by Alexander Cunningham, resident electrician at New York, who will make a tour of inspection of that station.

MANAGER A. F. Baker, formerly of Lima, Peru, arrived at Valparaiso, Chile, on November 15th, on the same date Manager W. B. Stevens arrived at Valparaiso. Manager Baker relieves C. F. Skinner, acting manager at Valparaiso. Manager W. B. Stevens will remain at Valparaiso for a short period and return to Lima to take charge of that station.

THE new twin screw cable ship *All America,* of the All America Cables, Inc., cable fleet, under the command of Captain Taylor, arrived at New York on November 8th. She is the newest and largest cable ship in the submarine cable service in the United States, using oil as fuel. The length is 295 feet, breadth 37 feet, depth 24 feet 9 inches. The ship is designed to carry total dead weight of about 1,750 tons. She is fitted throughout with the latest improvements for cable repair work. She will be employed together with the cable ships *Guardian* and *Relay* in patrolling the extensive cable lines comprising over 23,000 miles which connect the United States with the fifteen countries of South, Central and North America.

Expansion of American Cables

Another link was recently added to the chain of American-owned cables with the announcement by All America Cables, Inc., of the opening of their new extension to Porto Rico. This latest achievement, the completion of the first American cable to Porto Rico, represents but a step in the policy of the cable company to offer adequate cable facilities to every important city in Latin America and there to knit more closely together the peoples of the three Americas. Other extensions that have also been made recently are those between Guayaquil, Ecuador and Lima, Peru; Colon and Cartagena, Colombia; Buenos Aires and Rio de Janeiro; Buenos Aires and Santos; and between New York and Santiago de Cuba.

In discussing the present conditions of the company, President John L. Merrill spoke particularly of its remarkable growth during the last few years.

"The All America Cable System of today embraces the Mexican Telegraph Company and the Central and South American Telegraph Company. The former was established in 1879 and the latter in 1881. The name 'All America,' often misspelled 'All American,' was chosen as the most fitting phrase to designate a service dedicated primarily to the needs of the three Americas, South, Central and North. All America Cables now has more than 23,000 statute miles of submarine telegraph lines and more than 3,000 miles of land lines.

"The lines of communication 'Via Colon' or 'Via All America,' are two direct duplexed cables from New York to Colon, touching at Guantanamo Bay, Cuba. From this point branch lines run to Santiago de Cuba, and San Juan, Porto Rico, affording prompt communication to all the important centres of the West Indies. From Colon the cables cross the Isthmus of Panama by means of duplicate underground cables, uniting with cables at Panama and extending down the West Coast as far as Valpariso and serving the republics of Colombia, Ecuador, Peru, Bolivia and Chile. From Iquique a branch extends to La Paz, Bolivia, connecting Arica, Tacna and Corocoro. From Valparaiso there is an extension to Santiago, Chile, and triplicate lines cross the Andes to Buenos Aires, in the Argentine. The cables continue to Montevideo in Uruguay, from which point two direct cables have been laid to Santos and Rio de Janeiro in Brazil.

"From Galveston, Tex., there are triplicate cables to Vera Cruz and Puerto Mexico, the latter two places being connected by duplicate cables. From Puerto Mexico the lines continue across the Isthmus of Tehuantepec, and extend down the West Coast of Central America, serving all the Central American republics to Panama, where they connect with the lines from Colon. Communication with Mexico City is through a duplicate land line from Vera Cruz.

"In the fifteen countries served by the two component parts of All America Cables, Inc., there are maintained forty-four offices, manned by trained commercial and technical staffs. Skilled workers watch over the efficiency of office apparatus and land lines; a fleet of cable ships is constantly cruising the high sea lanes, ready for any emergency."

Submarine Cable Developments in Italy

Signor Giuffrida, Italian Minister of Posts and Telegraphs, speaking at the final meeting on October 21st of an electrical congress held at Catania, mentioned that a committee was engaged on the investigation of a scheme for the transmission of energy across the Straits of Messina to Sicily. As to his own particular department, the Minister is reported to have stated that new telegraph cables would be laid between the Continent and Sicily, between Ravenna and Trieste and Genoa and Nice, and new lines of direct communication with the principal European centres were being examined. In addition, an agreement had recently been signed for the establishment of a direct submarine cable to Spain and Uruguay, South America, and it was hoped to have another direct cable to the United States.

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Telephone Battery Charging Methods with Tungar Rectifiers

Tungar rectifiers originally developed for use in charging automobile starting and lighting batteries, are invading many other fields.

One field in particular where their qualities have made them highly successful is that of charging batteries for telephone lines, especially in the more isolated branch exchanges. For such use they have been found to have decided advantages over either the vibrating or chemical type of rectifier, as the former is subject to sticking of contacts, short circuiting the battery through the rectifier, and the latter is an unsatisfactory affair at best owing

to the use of liquid electrolyte.

There are two methods of applying the rectifier to the lines, depending on the type to be used. The first method is to use a noiseless type floated directly across the batteries on the line and the second method is to use two batteries one of which is being charged, while the other is on the line. There are several Tungars used for the second method, the size depending on the size of the battery. One of these which has a 24 and 30-volt tap, and about 6 ohms resistance, has been found economical for charging the 11 and 12-volt batteries used in private branch exchanges. It possesses considerable inherent regulation in the transformer, making it possible to charge at one ampere, 40 volts, or as low as 28 volts three amperes on the 30-volt tap. The efficiency of the set is approximately 50 or 55 per cent., except where considerable resistance is used, when it drops from 30 to 35 per cent., with all the resistance in.

For the larger private exchanges using power switchboards, a 30-volt 10-ampere set, with an efficiency at full load about 59 per cent., or a 40-volt, 12-ampere set with a full load efficiency of 63 per cent. or 69 per cent. at 46 volts, 10.8 amperes, generally is used. By putting a considerable amount of reactance in series between either of these rectifiers and the battery under charge and discharge on the line, they can be made as noiseless as any rectifier or generator.

In cases where a noiseless rectifier is used, and floated directly across the line and the batteries, a type has been designed for continuous twenty-four hour operation. It delivers just enough power to take care of the discharge and the losses. The set has a resistance stick inside the case so that the floating current can be adjusted from .3 to .5 amperes on 11 or 12 cells. It is especially valuable for smaller branch exchanges at some distance from the central offices, or where it is impractical to charge through the trunk lines from the central office. With a continuous floating charge the operator is relieved of the responsibility of charging the battery, and damage to the battery from either overcharge, or from being run too low, is eliminated.

Shop Talk

By THE OBSERVER

In the August 16th issue, page 384, of this journal, somebody wrote a letter signing it The Observer, and right there they "copped" my cognomen, but then, I failed to threaten extinction to anyone that would do such a thing. I blame the Editor for permitting it, and to exhibit my spite I am writing this. Either he must publish it or turn me down, and as he is a friend of mine, I think he will publish it and I will get even by "copping" his space.

Now, the purloiner of my "cog" was praiseworthy toward the articles appearing under the name of Louis Casper, but he wondered how Mr. Casper could understand all of the stuff he writes.

I will utter my praise for the lessons in telegraphy and say that Mr. Casper understands it because he is now, and has been for years, a student of the science of electricity, and I will go further and say that if anyone has been a close reader of the AGE for a few years he, or she, should be able to understand practically all of the excellent articles written by Mr. Casper.

A friendly tip to all is that they study carefully each issue of the AGE, especially the articles that pertain to their daily work, or to the department they aspire to reach.

After these articles are studied, bind them for future reference and you will have a reference book or books that will be princely.

Possibly I will have something else to say later on, because there's always room for an argument if a fellow is gabby.

A Knowledge of Phillips' Code an Asset to the Telegrapher

Phillips' Code, *Latest Edition,* a thoroughly tested code of abbreviations, arranged for telegraphic purposes and contemplating the rapid transmission of press reports; also widely used as an easily acquired method of shorthand. Revised and brought up to date, with supplement to August 1, 1921. The new edition contains about 700 additions to the older code, and is indispensable to the operator who aspires to the standard of proficiency required by press associations, which includes a knowledge of Phillips' Code. Flexible cover, vest pocket size, $1.25 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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Sir Charles Bright and Partners

PERSONNEL OF THE NEW FIRM

A partnership is announced between Sir Charles Bright, F.R.S.E., M.Inst.C.E., F.R.Ae.S., M.I.E.E., F.I.Radio.E., M.Inst.T.; Mr. A. Hugh Seabrook, M.I.Mech.E., M.I.E.E., consulting engineer (late chief engineer and general manager to the St. Marylebone, London, and other electric supply undertakings); Mr. A. J. Stubbs, M.Inst.C.E., M.I.E.E. (late assistant engineer-in-chief H.M. Post Office), and Lieut.-Colonel H. W. Woodall, C.I.E., M.Inst. C.E. (director and consulting engineer of gas and water companies), under the style of Sir Charles Bright and Partners, consulting engineers, with offices at 146 Bishopgate, E.C.2.

In addition to advising upon the installation and operation of telegraphs, telephones and wireless, the firm advises upon electricity, gas, water and colliery engineering. In view of the heavy cost of fuel, economies have to be studied today that were negligible before the war. In this direction the firm is specializing in fuel conservation in relation to the design and construction of power plants, steam, gas, electric, hydro-electric and oil, particular attention being devoted to the utilization of low grade fuels and carbonaceous materials hitherto regarded as waste products.

The name of Bright is known throughout the world in connection with telegraphy and electrical engineering generally. The original Sir Charles Bright, knighted at the age of 26, was closely associated with the laying of the first Atlantic cable, while the present Sir Charles—the senior partner of the firm—has been similarly active for many years in land, submarine and wireless telegraphy. Sir Charles Bright is also closely identified with aeronautics and the Air Service.

Mr. Seabrook is a consulting engineer, and has been for over twenty-five years engineer and manager of various electric supply and light railway undertakings.

Mr. Stubbs is the recently retired Assistant Engineer-in-Chief of the Post Office and a leading authority in telephony as well as telegraphy.

Colonel Woodall, trained as an electrical engineer, is a director of and consulting engineer to gas and water companies.—*London Financial Times.*

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International Telegraphic Conference at Riga

The United States Trade Commissioner, H. Lawrence Groves, reports from Riga, Latvia, that a recent event of importance was the international telegraphic conference, the first meeting of which was held in that city on September 10th. The following thirteen European countries were represented: Germany, Denmark, Norway, Sweden, England, Danzig, Memel, Latvia, Lithuania, Esthonia, Finland, Poland and Soviet Russia. The Great Northern Telegraphic Company was also represented at the conference.

Questions relating to tariffs, charges, settlement of accounts, etc., were dealt with.

The Late George F. Milliken

One of our subscribers, noting in the November 1st issue the obituary notice of George F. Milliken, tells of his experience in the Boston office when that gentleman was manager. We refrain from mentioning his name for obvious reasons. He writes: "Mr. Milliken hired me late in July, 1876, and fired me the next March. I recall attracting his unfavorable notice during my first day's duty, some three years before I had scraped acquaintance over the wire with the Boston operator working the way wire along the Boston and Albany Railroad, and on my next trip to the big city called on him. I saw him doing what appeared to me at the time to be a most wonderful thing, timing with his left hand while sending with his right. Thereafter I spent many hours at my lonely post as a railroad operator, emulating my accomplished Boston friend, whose name, I think, was Darrah. I practiced until I was able to print plainly with my left hand without forgetting how to send with my right hand.

That first day in the Boston office Fall River sent me a through message containing the word "rereeled." I questioned it, and Ned Beardslee, on the New York wire, also did so, returning it to me for confirmation. As I was sending at the time, I printed the word "rereeled" with my left hand and once more sent it along. In a few minutes I was relieved with orders to report to the manager, who asked me what I meant by insultingly printing my reply to a message returned for verification, and he wasn't satisfied with my explanation until we both went back to the Fall River wire, and with my left hand printed rereeled eight or ten times while sending a message.

Probably I devoted too much time to practical jokes and too little to the duties for which I was employed, and the culminating prank was my discovery of a baker's roll, left on one of the spare tables which operators used for their lunches. I immediately thought it would be fine to hand that to Rox Phillips, and proceeded to do so by the shortest air route, distance thirty to forty feet. Just as it left my hand, Night Manager Edwin Forrest Leighton looked up and watched the beautiful curve it described, landing several feet from its intended mark on Sam Eldridge's head. With all the dignity of the famous tragedian for whom he was named, Mr. Leighton stalked down the aisle and rendered the line "Young man, you may go home," in a truly dramatic manner. My banishment lasted something over five years.

A day or two later, in his own handwriting, Mr. Milliken sent me a nice long letter of dismissal, in which he recounted all of the instances he had record of, which rendered my retention in the Boston office undesirable. It was by no means a complete list. I remember at the time I was pleased to note that I had not been found out in several escapades. Managers had more time for minutia in those good old days."

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The Louisville and Nashville Railroad Right of Way

The suit of the Louisville and Nashville Railroad Co. against the Western Union Telegraph Company involving the right of the telegraph company to occupy the right of way of the railway with telegraph poles and wires were decided on November 5th in an opinion handed down by John W. Menzies as special United States Commissioner appointed by Federal Judge Cochran to examine the records in the case and render a decision.

Commissioner Menzies, who is clerk of the United States Court, in his report finds in favor of the railroad and awards that company a verdict of $2,300,000 for the use of its right of way for the Western Union poles and wires over a period of about nine years.

The litigation started when the contract of the Western Union for the use of the railroad's right of way expired. That contract had been in force for twenty-five years and stipulated that the telegraph company should enjoy the privileges of the right of way in return for furnishing telegraph service to the Louisville and Nashville Railroad Company. On the expiration of the contract the railroad demanded that the telegraph company pay a rental for its poles and wires. The telegraph company in turn sought to condemn the right of way for its purposes.

The case was carried through numerous courts, both Federal and State.

The present suit presented such a voluminous record that Judge Cochran was obliged to appoint a special master to digest it. It is the report of that master that has just been filed, and which now will be forwarded to Frankfort, Ky., for approval of the United States Court for the Western District of Kentucky.

In arriving at his findings of $2,300,000 rental in favor of the railroad, Commissioner Menzies assesses the Western Union $73.06 annually for every mile of the right of way used for poles and wires.

—o—

Inter-City Radio Company Beats Hoover in Air Case

Justice Stafford, in the District of Columbia Supreme Court, Washington, D. C., issued an order on November 21st requiring Secretary Hoover to give a license to the Inter City Radio Company of New York, so that a commercial radio business may be conducted throughout the East.

The order is the result of a spectacular case brought by the company to prevent its being put out of business by the Department of Commerce through refusal to grant a license, upon the ground that the wave length employed in sending the messages of the company interfered with the receiving of messages at another station near the sending station of the company located in New York City.

The action, which was brought a few days ago by Wade H. Ellis, as counsel for the company, has attracted unusual interest, as it involved the highly important question of whether the Federal Government had control of the air to an extent to which it might forbid its use altogether.

Congress in 1912 passed a law giving to the Department of Commerce the duty of administering rules and regulations for the operation of radio stations. Licenses have been granted to those who applied for them, but never has a case arisen where, except in the emergency of war, a license has been refused.

The Inter City Radio Company transacts a commercial business betwen several cities, including New York, Philadelphia, Pittsburgh, Detroit, Cleveland and Chicago. It has invested about $200,000. It has been operating for over a year under a license which expired on November 12th. Upon that date the Department of Commerce, asserting that the operation was interfering with another station, refused to renew the license. The corporation said that to forbid it from using the air would not only be exceeding the authority extended to the department, but also would be confiscation of the corporation's property.

The Government engaged in the suit to bar the company, but the court has decided that the Government, while able to supervise the use of the air, has no right to forbid its use to any one. The issue is important, not only with regard to the operation of radio stations, but also as it applies to aircraft flying between States.

The case will go to the United States Supreme Court for final decision.

—o—

Communication Restored as Gun Fires Wire Over River

Telephone and press communication with Portland and points as far north as Montana, cut off on November 22nd by the overflowing of the Santiam River, in central Oregon, was restored by shooting across the river a weight to which was attached a light wire.

A projectile gun was used. After ten attempts the wire was landed across a 400-foot gap and an emergency cable pulled across.

—o—

M. F. ROBINSON, a well-known Old Timer and a Military Telegrapher during the Civil War, now located at Sanford, Fla., has just celebrated another birthday.

The *Sanford Daily Herald* has this to say about Mr. Robinson: "M. F. Robinson, of this city, says he is only seventy-eight years old, yet who has a birthday several times during the year, celebrated another one last week, and while few people knew about it, several of his friends remembered it, and the following wire was received from Victor and Belle Check: 'Were we editors today, we would get an extra out and say: "Beneath your handsome printed phiz, we wish you all the joys there is." P. S. We wish it any way.'

"To which Mr. Robinson replied by return wire:

"'It would justify living for generations to receive your sweet congratulations. P. S. I intend to anyway.'"

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY

By Louis Casper

Lesson 40

In Lesson 39, the standard double petticoat insulator was described. It will be interesting to know that within the past year a new type insulator has been placed in service which may shortly supplant the older type in nearly all future line construction. This new insulator (Fig. 110) is made up of cast glass and is provided with a top groove in addition to the side groove of the older type. The double petticoat groove is included in the design of this insulator, but is somewhat deeper and there is added around the outer bottom edge of the casting a series of projections or points which provide a rapid dripping medium for any rain or moisture that may fall upon or form on the surface of the glass.

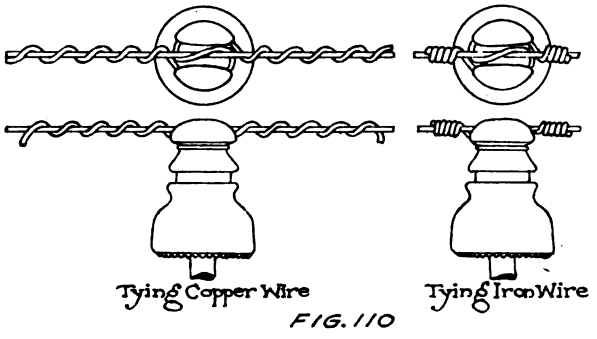

FIG. 110

An additional advantage may be seen with the new type insulator in that each insulator on a line must be regarded in wet or foggy weather as a conductor, and, as such, is subject to the same law as every other conductor; that is, the resistance which it will oppose to the escaping current is directly in proportion to the length of the conducting film upon its surface and inversely as its cross-section. Hence the length of the insulating surface measured from the point of contact of wire which in this type of insulator is secured to the top of the same to the point of contact of the supporting pin is as great as it can be possibly made on an insulator of this size and weight.

It is true that the old type insulator is somewhat smaller in size than the new type; but on the other hand, a comparatively great part of the insulating length of the latter is underneath where it is well protected from the direct action of falling rain.

The new type or top groove insulators, as they are termed, are at present specially confined to locations where exceptionally heavy vertical loading or downward pulls of wire are likely to be experienced. This is because of the fact that the strain of holding up the line is borne more by the insulator itself than by the tie wire that secures the wire to the insulator. With the old type insulator the reverse of this condition is true.

The method of tying either copper or iron wire to the top groove is graphically shown in Fig. 110. The tie made on copper wire is accomplished by the hands only, no tool of any kind being employed, as explained in the previous lesson.

Distribution of Potentials in Telegraph Circuits

The manner in which the varying potentials at points in a simple electric circuit may be graphically delineated in accordance with Ohm's law. We will first show a simple circuit of uniform resistance with a generator G included therein (Fig. 111 diagram "a"). The current in this circuit we may say, starts out with a flow in the positive direction until the point "o" is reached. At this particular part of the circuit there is neither a positive or a negative flow of current. When the point "o" is passed

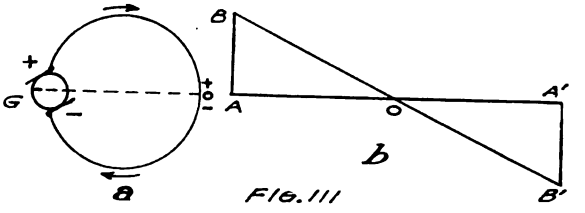

FIG. 111

through the lower half of the circle on its return to the generator, the current flow is negative. The point "o" of this circuit is known as the "zero" or "electric" center.

Every circuit, whether long or short, has an electric center, at which point there is neither a positive nor a negative current flow.

If we assume that the flow of the current from one cross-section of the ring, as shown in diagram "a," Fig. 111, to the other cross-section is due to the difference of potential, it follows that the positive and negative currents proceeding in opposite directions from the generator G must exhibit a decrease in potential the farther they recede from the starting point. This decrease may be better understood by means of a diagram showing the "ring" circuit stretched out into a straight line ("b" Fig. 111). Let the vertical line *ordinate AB represent the positive potential at A, and A', B', in like manner the negative potential at A'; then the line B B' will denote the value of the potential in all parts of the circuit by the corresponding varying lengths of the vertical ordinates at any point between AO or OA'. The quantity of the current in the circuit is proportional to the characteristic curve representing the steepness of the fall of potential and is thus a graphic representation of Ohm's law.

In practical telegraph operation, the conductors employed in circuits for such operation, are rarely if ever homogeneous, that is, they are rarely made up of one wire of uniform size and kind throughout, but consist of several conductors of varying conductivity, and, therefore, the gradient potential drop, characteristic of the outline of a telegraph circuit if plotted out on paper would present a somewhat irregular curve and would also tend to show that the electric and linear center of the circuit were not coincident to each other.

*For the meaning of ordinates see Lesson 25.

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In pointing out the application of this graphic method of potential distribution in a telegraph circuit, it is assumed that the circuit discussed in the first instance is perfectly insulated. The best condition of an overhead telegraph circuit is that in which the electrical center of the circuit coincides with the center of the overhead section.

CONDITIONS OF A PERFECTLY INSULATED CIRCUIT

If a potential of 160 volts be connected to a perfectly insulated line of, say, 100 miles in length, and open at the distant end (see Fig. 112, diagram

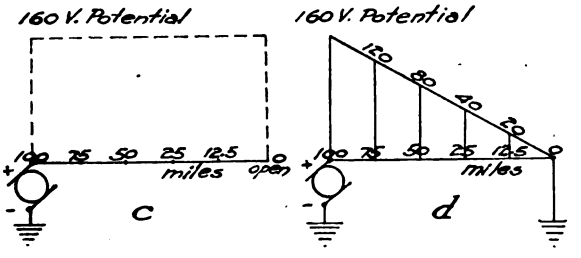

FIG. 112

C), the wire will acquire a potential throughout its length of 160 volts, which is equal to the e.m.f. of the generator. This would be the case, regardless of the length of the line.

If the distant end of the line be grounded (see Fig. 112, diagram d) there will be a current flow all along the line. This will not affect the e.m.f. of the generator, which will still remain at 160 volts, but the potential flow will be changed in every part of the circuit. The distant end of the line being grounded, the potential at that point will be zero, assuming the potential of the earth to be at that figure. From the distant ground to which the circuit is directly connected, the potential rises gradually and uniformly along the line to the terminal or pole of the generator, which, owing to the resistance in the battery lead (see Lesson 37) will be something less than 160 volts. After having

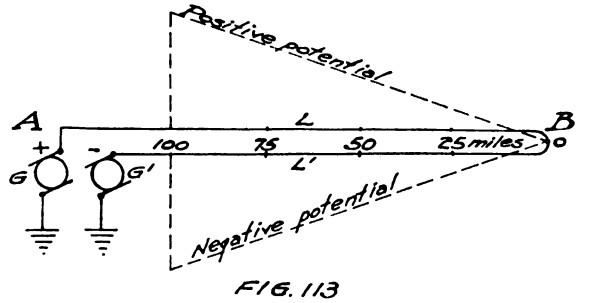

FIG. 113

ascertained the actual potential at this or any point on the line, it may be readily calculated for any other point, for in a circuit of uniform resistance the potential varied directly as the distance from the zero end of the line. Thus, if it be known to be 80 volts at 50 miles, it must be 40 volts at 25 miles, 20 volts at 12.5 miles and so on. the different points being represented by the sloping dotted line in Fig. 113. The potential in this figure is shown as having a positive direction, but the law is the same with a negative potential. An example is given in Fig. 113, which represents two parallel insulated lines, each 100 miles in length, looped together at the distant end B. At the terminal A each of the lines L L′ is connected to a generator G G′. The generator G imparts a positive potential to the line L and the generator G′ a negative potential to line L′. The potential falls regularly on line L from the positive pole to "o" and also rises regularly from the negative pole on line L′ to "o". If a wire be connected between the earth and any point along the length of L, a current would flow from the line to the earth, the quantity of which by Ohm's law would be in proportion to the potential at that point. If the wire were connected in the same way to any point on the line L′, a current would in a like manner flow from the earth to that line. In Fig. 113 it will be observed that there are two points of zero potential where it changes from positive to negative, one at the ground at A and the other at the point where the lines L and L′ are looped. This distribution of potentials is the same as that shown in diagrams "a" and "b" in Fig. 111, the principle involved being more fully illustrated in Fig. 113.

In the next lesson the distribution of potentials in imperfectly insulated circuits will be shown.

(To be continued)

"In One Man's Life" is the title of a book reciting the personal and business career of Theodore N. Vail, written by Albert Bigelow Paine.

Theodore N. Vail was one of the few great figures in our modern industrial life who succeeded in winning the complete confidence of the American people. The life story of this curiously modest man, who by his faith in the telephone and telegraph built up one of the greatest institutions in the world and "made neighbors of a hundred million people," reads like romance.

By happy chance, Mr. Paine was personally associated with Mr. Vail, as with Mark Twain, during his latter years; and as in Mark Twain's biography he has preserved to us the intimate human aspect as well as the story of achievement of this other great American.

Shortly before he died, Theodore N. Vail said to Albert Bigelow Paine: "Don't write a biography of me; anything so set and formal as that would be distasteful to me and useless to others; you have the facts, make the story simple." So here it is—the story of this Ohio boy who both came East and went West, who undertook an almost superhuman task, and succeeded, in a dozen years or so, in coordinating and unifying telegraph and telephone communication throughout the country, an accomplishment which it is hard even now fully to comprehend.

The book itself is beautifully bound in cloth with embossed front cover. Crown 8vo. with eight illustrations. Price $3.00. For sale by TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

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EDITORIAL COMMENT

Another Western Union Telegraph Company

In our issue dated November 16th on page 532 an article appeared under the title of "Another Western Union Telegraph Company." It recited that a company to be known as the Western Union Telegraph Company had been granted articles of incorporation from the Secretary of State of Wyoming. It was claimed that the new corporation was to conduct a system of telegraphy for the benefit of the public of that State. The Western Union Telegraph Company, organized under the laws of New York State, through its Denver officials protested against this new concern being granted its name, but without avail. The Secretary of State of Wyoming said that the New York corporation had never filed articles of incorporation in Wyoming and had not paid the two thousand dollar filing fee, which, no doubt, was the principal reason why the new concern was granted a license to do a telegraph business.

Francis V. Hertzig, a lawyer of Powell, Wyoming, who is connected with the new company, in newspapers of that State describes as libelous the intimation that the newly incorporated company of Wyoming has stolen the name of the old Western Union Telegraph Company. Despite the fact that the old Western Union has been engaged in business in the State of Wyoming for many years, the name was never legally appropriated and was, therefore, open to adoption by anyone. This, the new Powell concern has done according to State laws, and determination of legal phases of the case probably will be taken to court by the New York Company.

The Western Union Telegraph Company, incorporated under and pursuant to the laws of the State of Wyoming, says Hertzig, "not only intends to engage in a legitimate business in wireless telegraphy, but has sufficient financial backing to carry such an enterprise to a successful conclusion. The size of the State, the distance between town and stations and the enormous expense and upkeep on a wire concern, with the innumerable poles and wires, as opposed to the small installation cost and upkeep of a wireless system foreshadows a successful financial venture.

The wireless industry is in its infancy and the advantage of being in on the ground floor with a 50-year charter with renewal privileges is an appreciable factor."

Mr. Hertzig forgets to tell us how the new corporation happened to select the name of the Western Union Telegraph Company to conduct a wireless business. Certainly the name of the new concern is far from indicating a wireless service. There were hundreds of better titles available for a wireless telegraph company, and Mr. Hertzig will have to offer additional explanations to satisfy the average citizen of Wyoming, that there is not a sinister motive in selecting this name for the new company.

The United States Supreme Court had held that corporations doing an interstate business were exempt from compliance with such incorporation laws as are on the Wyoming statute books.

Mr. Hertzig should also remember that on August 13th, 1912, Congress bestowed on the Department of Commerce the duty of regulating radio traffic in the United States. Therefore, the Wyoming Company before it can do a public business must obtain a license to do so from the Government. We well imagine what will happen when Mr. Hertzig appears before Secretary of Commerce Hoover and asks him for a license to do a wireless business in the State of Wyoming under the title of the Western Union Telegraph Company.

The new company, by reason of its name, will be limited in its operation to the State of Wyoming, supposing it obtained a Government license, for the reason that if it attempted to do business in Nebraska, Colorado, Utah or other adjoining States, it would be prevented from so doing under the name of the Western Union Telegraph Company.

Grabbed a Monument

The attempted appropriation of the name of the Western Union Telegraph Company by Wyoming parties recalls an incident that happened away back in the eighties. The Ames monument, erected by the Union Pacific Railroad Company, had been completed and was admired by the thousands of travelers over the Union Pacific Overland route, which at that time passed just north of the site. In some manner, one W. L. Murphy of Laramie heard that title to the land upon which the monument had been erected was still in the name of the Government of the United States. With pardonable shrewdness he proceeded to the land office at Cheyenne and filed a desert claim upon the particular forty acres occupied. Thereafter, he advised the railroad company that their monument was on his property and that it would please him if it were removed; he had no use for it.

There was no little consternation in headquarters of the Union Pacific Railroad at Omaha. The right-of-way man had evidently permitted his foot to slip. An attorney for the company hastened to Wyoming and picked up Attorney John A. Reiner, at that time an attorney for the Union Pacific Railroad at Cheyenne, and went on to Laramie. They gave Murphy a session that savored of the third degree and finally compromised with him by giving him in exchange for his forty acres of land a couple of lots in Laramie, lots which Murphy subsequently disposed of at a good price.

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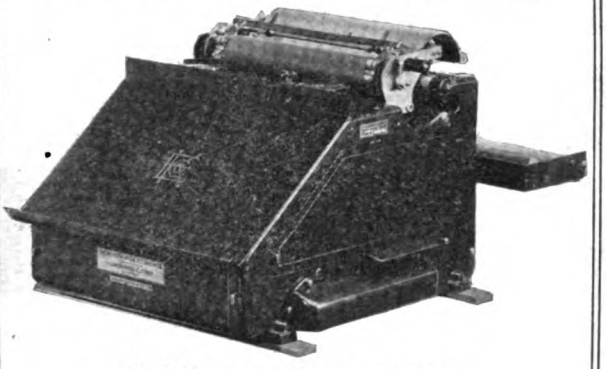

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The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

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Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

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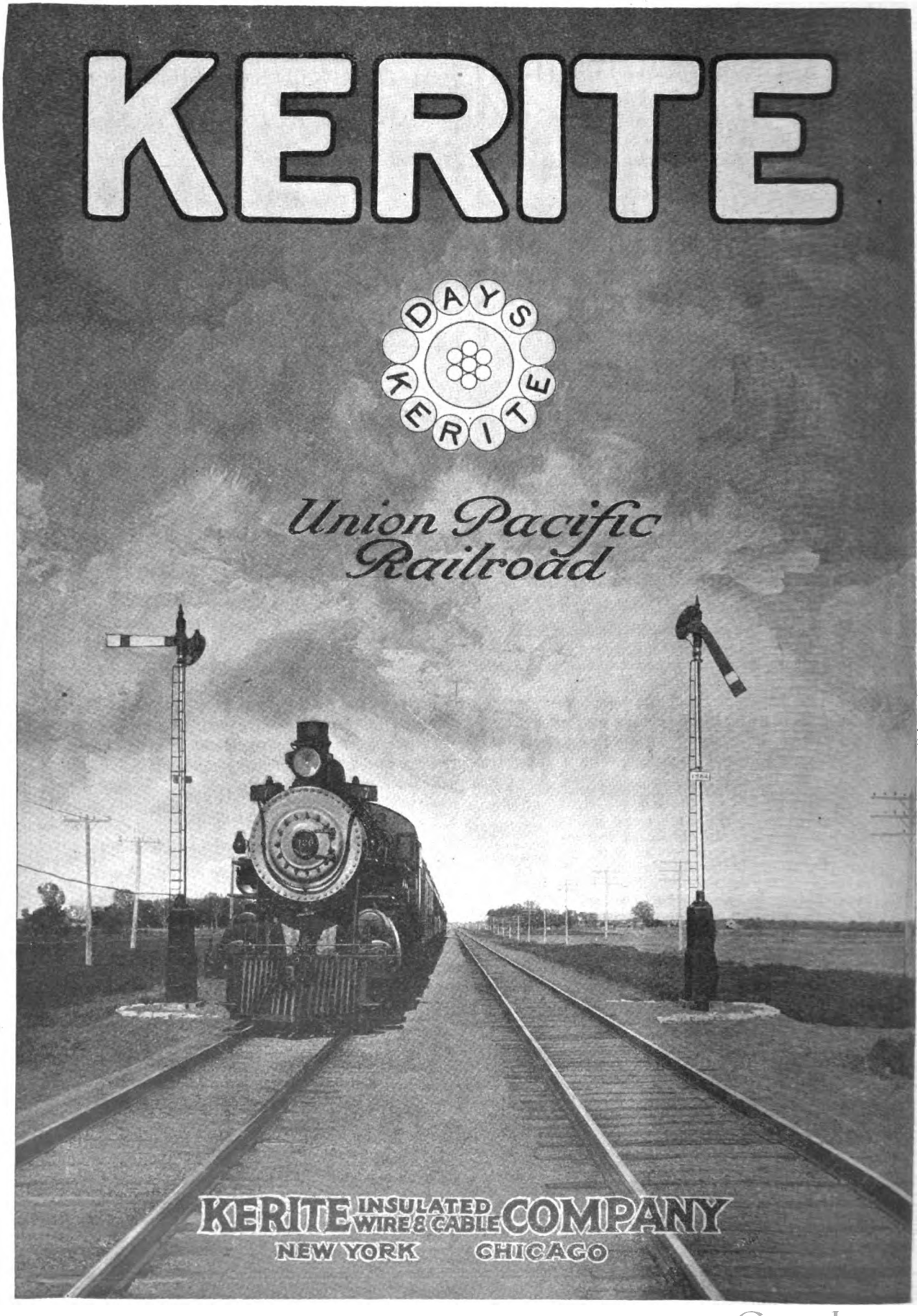

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THE RAILROAD

A meeting of Committee No. 2, Construction and Maintenance, Inside Plant, and its sub-committees, was held in Chicago on November 8th, 9th, 10th and 11th, to formulate specifications for its report for the March meeting of the Telegraph and Telephone Section of the American Railway Association, which will take place at Richmond, Va., on March 20th, 21st and 22nd.

Sub-Committee A—Construction and Maintenance of Pole Lines, met in New York on November 14th and 15th. Sub-Committee B, Wire Crossings, held a meeting in New York on November 16th. Sub-Committee C, Underground Construction, held a meeting in New York on November 17th. A Special Committee on Rules and Organization held a meeting in New York on November 17th and 18th and the Committee on Direction held a meeting in New York on November 19th. At all of these meetings considerable routine business was handled in preparation for the Richmond meeting.

THE New York Central Lines officials, A. Behner, Cleveland; W. A. Jackson and C. E. Baxter, Detroit; J. M. Niesse, Indianapolis; A. R. Belmont, Boston; G. T. Stanton, Columbus; S. L. Van Akin and Stanley Rhoads, of New York, met in the office of E. C. Keenan, general superintendent, New York, on November 18th to consider engineering matters pertaining to the New York Central Lines.

Railway Operation in Belgium

Hitherto the telegraph only has been used in operating railway trains in Belgium. At the beginning of October the telephone was installed on the Brussels-Namur line and on the Schaerbeek quadrilateral. The apparatus was supplied by the Bell Telephone Company and the American Western Electric Company, Antwerp.

THE Great Northern Railway of England has installed on its dining cars on its through trains electrical cooking apparatus, which has proved successful, according to a report printed in the *Electrical Review* of London under date of November 4th.

Patent Office Crippled

A statement prepared by the Hon. Thomas Robertson, United States Commissioner of Patents, describing the serious condition which exists in the Patent Office owing to inadequate appropriations, has been received.

The statement shows that the arrears of work in the office have increased from 15,000 applications two years ago to more than 56,000 applications now, and that the office is running behind 400 applications a week. A slight increase in fees, as provided for in a bill which is pending in the House would remedy the situation and restore efficiency in the office.

Some Phases of Railroad Telegraph and Telephone Engineering

By STANLEY RHOADS, New York

The interesting comments of Mr. William Maver, Jr., on my paper entitled "Some Phases of Railroad Telegraph and Telephone Engineering," call for reply in your magazine along the line of the remarks I made on them at the Cleveland meeting of the Telegraph and Telephone Section, and because many who read your paper may not have access to the minutes of the aforesaid meeting.

Also an inference apparent from some of the discussion at Cleveland that the paper was in the nature of an advertisement for the New York Central Lines, seems to add warrant for comment. Nothing could be plainer than the statement at the middle of the first page, in which it is stated that the data in regard to the plant of the railroad with which the author is connected, was given to properly lead up to the discussion of the problems involved, and as this only takes 3 of the 79 pages, it seems to be answer enough. The thought that no engineers were in the employ of railroad telegraph departments until very recently is also not in accord with the text of the paper, as in the second sentence it is stated that they have been employed in increasing numbers, which plainly implies that there have been engineers in this department previously, and which is in accord with the facts, as some of the railroads have had them for 15 to 20 years, although not always with the title of engineer.

I desire to state with emphasis that the object of the paper was to put into print, for the use of others, the results of our experiments and to bring out discussion and to give an idea of the extent and variety of the problems in the telegraph and telephone work on the railroads.

Mr. Maver's excellent book on "American Telegraphy" was before me when doing the work which formed the basis of my paper and was most useful in that work, in giving me the results of past experiences along the same lines. Also Mr. Fowle's paper has been in my possssion since it was published. The two texts mentioned, as well as others that I consulted, did not give me enough facts as to the simultaneous conditions that take place in the various branches of the duplex and quadruplex circuits, and at this time, after taking nearly 500 oscillograms, I still find that there are conditions that I would like to investigate in order to arrive at a complete understanding of these simultaneous relations.

One of these things that needs further visualization is the relation of the simultaneous action of neutral relay armatures to the applied current wave, with different tensions in the rectractile springs and with different adjustments of the air gaps. These two variables make it possible to cause a contact to close at various times in relation to the wave of current, and if the results were known, it might be possible to predict more closely than is now

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possible just what action would result with various circuit combinations.

Another thing that needs to be demonstrated to the eye, is the difference in wave shape of current (and voltage) on different kinds of lines. There is a decided difference between the different kinds of lines, and with proper experimentation, reducing the time of revolution of the recording drum on the oscillograph so that the recorded waves have a long slant, it may be possible to readily distinguish between the waves of different circuits. It is not possible to distinguish much difference in the results we have so far obtained, yet we know by ear from the results on the relays that there is considerable difference. By following out this line of experiments far enough and taking enough records, it would be possible to work out a set of telegraph transmission equivalents for various apparatus and kinds of wire and cable, like the transmission equivalents used in telephony, so that one could predict what the result would be with any particular combination of lines and apparatus. The difference between the wave shape, or rather wave front, using different kinds of telegraph sets on the same line, should be similarly investigated.

The books and papers so far available give us only approximations and do not give the actual condition during the transient state in the waves. A person can take paper and pencil and try to figure out the simultaneous transient conditions, but, in my opinion, will come far from the exact facts. This method of attack, backed up with the oscillograph, gives the proper present-day method.

In regard to the light and heavy writing experienced in duplex telegraphy on the railroads, it is interesting to discover that this is a comparatively new phenomenon in the art. It is due, perhaps, more to the greater time constants of the present-day lines, which to me means less steep wave front, which result from the increased amount of cable rather than to the 5-U coil or the wide polechanger travel, because it is experienced with differential as well as bridging sets.

It appears that Mr. Maver did not follow through on his own line of attack on the light and heavy writing problem. The six figures required for the full consideration of the matter are given. Nos. 1, 2 and 3 are the same as given by Mr. Maver. Nos. 4, 5 and 6 are for the reverse condition, which is with the home key open. For greater ease in following the current variations I have shown a milammeter at the home station which in each case indicates the current in the polar relay with the conditions as given.

I follow Mr. Maver in his discussion of Figures 1, 2 and 3 up to a certain point. That is, with both keys closed the current in the polar relay will be 50 mils and in the marking direction, as shown in Figure 1. When the distant polechanger is opened and held midway between the poles the condition will be as shown in Figure 2 and the current in the polar relay will be but 25 mils but still in the marking direction and the marking signal will continue. Now, if the distant polechanger is closed on positive battery the condition becomes as shown in Figure 3. Here comes the point that Mr. Maver failed to diagnose properly—to wit: when the distant polechanger is opened again and held open and not on either pole, the current is, as Mr. Maver says, 25 mils, but it is in the *marking* direction and has reversed the polar relay at the home station as shown in the milammeter. This means that when the distant polechanger changed from the condition of Figure 1 to that as shown in Figure 2 it did *not* change the signal, but that when it opened from the condition of Figure 3 to the condition of Figure 2 it *did* change the signal. The marking signal is thus lengthened by delay at the time the distant polechanger leaves the marking pole and by prompt action when it leaves the spacing pole to begin another marking action.

In Figure 6, the distant polechanger is on the marking pole and the home key is open with the current 50 mils in the marking direction as shown in the milammeter. If the distant polechanger opens and is on neither pole the condition is as shown in Figure 5 and it is seen that the polar relay has been reversed to 25 mils in the spacing direction. With the distant polechanger on spacing battery the condition is as shown in Figure 4 and is 50 mils in the spacing direction. When the distant polechanger is again opened and not on either pole, the condition becomes as of Figure 5 again and the spacing signal continues with 25 mils in the spacing direction through the polar relay at the home station. Closure of the distant polechanger on marking battery, which is negative polarity, gives the condition of Figure 6 again and changes the current from 25 mils spacing direction to 50 mils marking direction. This means that with the home key open, as soon as the polechanger leaves the marking pole the marking signal *does* end and that when it leaves the spacing pole it does *not* end the spacing signal. The marking signal is thus shortened by the reversal that occurs when the distant polechanger leaves the marking pole and by delay in reversal when it leaves the spacing pole to begin another marking signal. This is just the reverse of the results brought out in the preceding paragraph for the conidtion of home key closed.

This shows conclusively that the light and heavy writing has cause, but which may not exist in the sets formerly used which had circuit preserving polechangers. Computations show that the condition is improved by the use of lamp resistance in the battery leads because these resistances are used jointly by the current through the line and from the artificial line. When the condition of Figures 2 or 5 exist, if there is lamp resistance in the battery leads, the current in the artificial line will be reduced below what it is if no current flows in the main line because of the joint use of the lamp by the main and artificial line currents. In this case the milammeter would show some value less than 50 mils; that is, it would be farther in the direction it is wanted in, and the tendency will be to cause more prompt action of the polar relay in response to the action of the distant polechanger.

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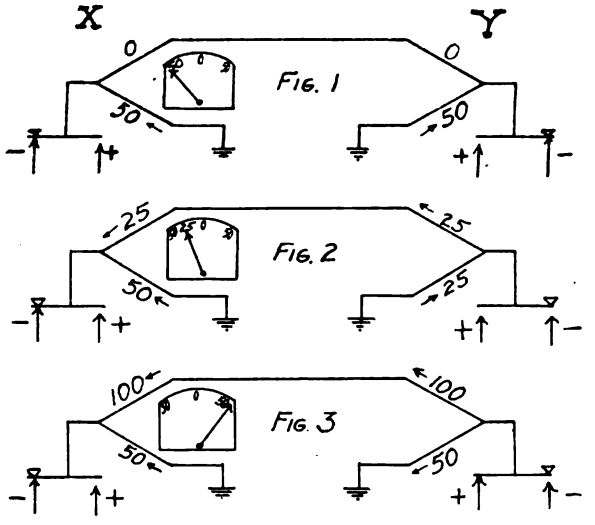
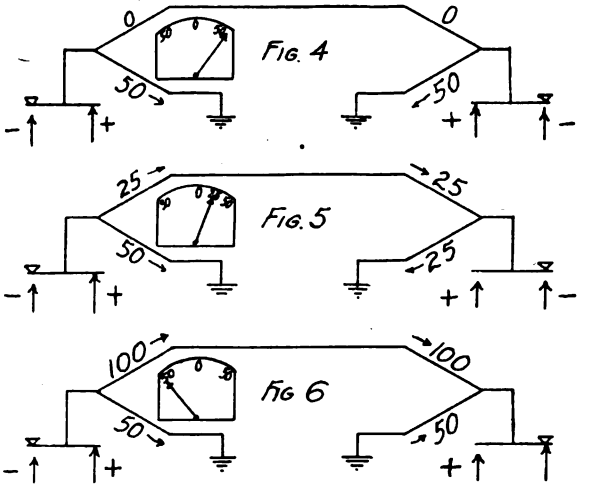
It may be that the duplexes that used gravity battery with its high internal resistance were thus benefited thereby. It also would indicate that increase of terminal lamp resistance would benefit present day sets in this regard, but the difficulty is that many duplexes need all the current available and additional resistance would be disadvantageous, because the current would be reduced.

The distinction that Mr. Maver has drawn between charging and discharging current in the holding condenser, to my mind, is not entirely correct, if considered as follows:

Assume a condition of closed keys on all corners of a quadruplex; the holding condenser will be in a charged condition, of maximum value. Now, if the distant polechanger reverses, it starts a wave along the line, which causes a change of potential





to occur across the holding condenser, which will cause the condenser to have the charge that was in it pushed out, so to speak, by another charge, but the current that goes in to it to do the pushing is in the same direction as the current being pushed out and continues until the steady state is reached after the complete reception of the incoming wave from the distant station. The result is a pulse of current in the holding circuit, in phase with the line current, beginning when the line wave begins and ending when it ends. One oscillogram, No. 431, in the February 1, 1920, issue of the TELEGRAPH AND TELEPHONE AGE, page 66, also shows the pulse in the condenser circuit in trace No. 2 and its relation to the line wave. The point to this is that the condenser current at each reversal of distant polechanger is all charge going into, or rather through, the condenser. The charge and discharge are inextricably rolled into one pulse of current.

Considering the Rhoads relay as performing the function of holding the reading sounder circuit of the common side closed while a dot might otherwise be split by the neutral relay falling against the back-stop when the distant polechanger reverses, makes the term "holding relay" appropriate.

Since the holding condenser pulse is in phase with the line wave that caused it, it is only necessary to get the holding circuit to pick up at the precise instant that the neutral relay would strike its back-stop, and thus prevent a false signal. This is not as easy as it seems. It is necessary to know the action of the neutral and holding relays in relation to the current wave and to the air-gap and retractile spring tension, facts that are not definitely known at the present time, except, perhaps, in laboratories where the data is not made public, and which data we should obtain experimentally as stated in the early part of this letter. The best information obtained by me so far, is in oscillograms Nos. 543, 544 and 545, as well as in actual results as stated in the paper presented at Cleveland on page 69 of my paper; results which show the simultaneous action or co-ordination to be successful on single-wire circuits. The current is maximum in the holding circuit at the very instant that it is zero in the neutral relay. This is at the middle of the reversal of the line wave. Consequently, the holding pulse of current comes at the desired time, but it is dependent upon the characteristics of the neutral and holding relays as to whether this pulse can be made successful use of.

No trouble has yet been experienced with the holding relay being actuated by current from the short pole reversals at the distant end. The reason is that the ordinary Morse relay has very wide margin of adjustment and, if adjusted so it just pulls up on a given current, there is no trouble from its picking up on one-third of this current, which it would have to do on a quadruplex which works on a 3 to 1 ratio.

In connection with the good service which the quadruplex gave years ago between New York and Chicago—points now beyond the range for quadruplex-working—it seems worth while to note that these lines were practically open wire from operating room to operating room, including open wire through the city streets and included but little cable; whereas at present there are untold amounts of cable and growing worse in this respect. The tests we

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have made indicate that it is the capacity effect that plays havoc with the speed of reversal of current, and which causes the trouble in the quadruplex. If the wave has a steep front, it causes a quick reversal in the neutral relay, which is more easily bridged over by the holding devices. The capacity reduces the steepness of the wave front of the received wave.

The omission of the bug-trap relay was tried before we made the later Jones quadruplex tests, and it was found to be indispensable at that time. Some further tests will be made soon on longer lines than those mentioned on page 69 of my paper, and omission of the bug-trap will be tried again. With 400-ohm local sounders operating on 110 volts the sluggish action in local circuits is greatly reduced, in our experience, and the bug-trap does not seem to cause appreciable lag.

That many statements that I made in my paper seem to be restatements of old facts, makes it timely to state that we will have to watch closely in the future to prevent wasted effort in reinvention and rediscovery of many things because of the rapidly increasing complexity of science. A problem being handled by a committee of the American Institute of Electrical Engineers is to card index all known facts on electrical subjects. Science has been described as organized knowledge, and there is plenty of chance for improvement in this organizing and card indexing of facts, as anyone can testify who has tried to follow up some subject and has found that text as indicated by title is far from being what the searcher is led to expect. It also indicates the difficulties ahead of the index-maker.

The problem of low resistance instruments for heavy way Morse wires is an old one, as Mr. Maver says, and was brought out in my paper because of the special case of the use on block telephone simplexes and to indicate the matter of insulation as related to the problem.

I failed to give credit in my paper to the line resistance invented by Mr. Stumm, as when the early draft of the paper was made we were not making much use of it, because the wires in duplex service were generally high resistance simplexes on dispatching circuits and were worked on the highest current obtainable without excessive voltage but which current, at best, was generally near the low limit for duplex working. Consequently, no benefit could be made by the insertion of resistance in bad weather. However, in recent months we have converted many dispatching telephone simplexes into low resistance types by the use of repeating coil operated selectors. These simplexes give ample margin of current, when duplexed, and in bad weather the Stumm resistance box is found valuable. Mr. Stumm, by the way, does not like the term line resistance box. He prefers the word "box" omitted.

In conclusion, it seems proper to say that the remarks herewith are fair indication that the performance in the quadruplex and duplex is to a great extent a matter of guess-work, if attempted by graphics and charts, and our attempt has been to help take the guess-work out of it, which attempt has only been partially successful up to date. One motive in the work has been to make visible many of the well-known audible phenomena. Two senses are better than one on a problem, or three are better than two, if eyes, ears and mind are counted as one each.

A Reply to J. Brown of Beaver Dam, Ohio

Editor, TELEGRAPH AND TELEPHONE AGE:

In a communication from J. Brown, of Beaver Dam, Ohio, in your issue of November 16th, it is erroneously stated that "in an article on polar duplexes (by the way, it was not an article on polar duplexes), Mr. Maver, Jr., takes issue with Stanley Rhoads on the existence of a tendency for the polar relay to write heavy when the home relay is closed, etc." On the contrary, the writer stated on page 478, first column, October 16th issue, in plain English on the subject in question: "I do not, however, gainsay Mr. Rhoads' statement, because there must be reason therefor."

WM. MAVER, JR.

New York, November 22, 1921.

Communication Engineers Have Meeting

About one hundred and fifty telegraph, telephone and radio engineers were present at the November 17th regular meeting in New York of the American Institute of Electrical Engineers, on which occasion Dr. A. N. Goldsmith presented a lecture on "World Communication."

Dr. Goldsmith illustrated his lecture with forty-five lantern slides showing views of submarine cable apparatus and operations, long distance telephone repeater equipment, and high power radio stations and equipment. Also, several reels of moving picture film were reproduced, showing submarine cable working and the latest method of receiving radio signals—by means of specially constructed tape recorders.

Among those present were Col. Samuel Reber, B. H. Reynolds, W. I. Slichter, F. H. Kroger, A. R. Belmont, Stanley Rhoads, J. L. Niesse, M. A. Noss, Dr. L. M. Potts, S. B. Kent, Calvert Townley, E. F. F. Creighton and G. R. Metcalfe.

President McClellan of the Institute being absent, Donald McNicol, chairman of the Telegraphy and Telephony Committee, presided at the meeting.

THE Belgian Government is going to construct a big wireless station near Elizabethville, Katanga (Congo). Through this station, which, it is expected, will be finished in 1923, direct communication with Belgium will be possible.

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PERSONAL

COLONEL Edgar Russell, chief signal officer of the Second Corps Area, New York, has been advanced to the grade of Brigadier General and has been placed in charge of Artillery, with headquarters at Camp Dix, N. J. General Russell is well known to the telegraph and telephone fraternity of the country and was a member of General Pershing's staff in France during the World War.

SHOJIRO YAGI, director of the Central Telegraph Office, Osaka, Japan, is a New York City visitor. He is on trip of inspection of telegraph and telephones in this country. He has already visited San Francisco and Chicago and will sail from New York in a few days for England and he will visit Continental countries while on his return trip to Japan.

ROSCOE H. JOHNSON, president of the Commercial Telegraphers' Union of America, Chicago, was taken to the hospital in that city on October 31st for observation. Mr. Johnson has not been well since his return from France three years ago. His condition is now said to be serious.

D. S. ROBESON, of Philadelphia, well known in telegraph circles as one of the oldest telegraph line builders in the country, was a New York City visitor a few days ago.

HENRY E. HUTCHENS, of the Southern Railway, Washington, D. C., was a New York visitor on November 16th.

POSTAL TELEGRAPH-CABLE COMPANY

C. A. COMSTOCK, assistant to the general manager, is on an inspection trip which will cover many of the important offices in the Western Division.

E. P. TULLY, assistant to the general manager, is back in his office after a trip through the Eastern Division.

W. C. DAVIET, assistant to the general manager, recently made a trip to Washington, Baltimore and Philadelphia.

New York City

MESSRS. Campbell and Rodgers, of New York City, spent a short time in Washington assisting the local office in taking care of the press file incidental to the Conference on the Limitation of Armaments.

M. F. GEIGLE, of E. P. Tully's office, recently inspected this company's Boston offices.

S. F. AUSTIN, of New York, has gone to Havana, Cuba, in the interest of the Commercial Cable Company of Cuba for the winter months.

JOHN A. MANNING, for many years cashier of the New York City offices of this company, died at his home in Jersey City on November 24th. Mr. Manning, who had been in poor health, had not been able to attend to his duties for some time. He is survived by a wife and two sons, who have the sympathy of everyone connected with the company in New York.

WILLIAM ANDERSON has been promoted from the managership of the 502 Hudson Street office to that of chief operator at the Broadway and 42nd Street office.

M. MESSENGER has been promoted from operator at the 42nd Street and Broadway office to the managership of the 502 Hudson Street office.

MISS B. E. Gleason, for many years in charge of the 356 East 138th Street office, has been granted an indefinite leave of absence, on account of poor health.

MISS H. A. McCreedy has resumed her duties as manager of the branch in the Hotel McAlpin.

REGGIE CASSERLY has been promoted to a position in the cashier's office at 253 Broadway.

Chicago

GENERAL Superintendent E. W. Collins and Superintendent L. R. Thomas recently made a trip of inspection in the sixth district, which included visits to Des Moines, Waterloo, Cedar Rapids, Omaha, Sioux City, Lincoln, Hastings and several other offices.

Cleveland

J. H. WENTLAND, for many years in the operating department at Cleveland, Ohio, died recently in Denver, where he had gone in hope of regaining his health.

M. N. BAKER has returned from his annual vacation, part of which was spent in Chicago, visiting the operating department.

H. V. GLORE has been transferred to Fostoria, Ohio, as manager.

J. C. EDWARDS, who has been doing good work on the Buffalo local, has been transferred to the manager's department, where he will spend his entire time hereafter.

CHIEF Delivery Clerk J. M. Eynon and Miss Ruth Deal, formerly our chief bookkeeper, were married recently.

Managers Appointed

Mrs. G. M. Congdon, Dunkirk, N. Y.; J. A. Cervenka, Owosso, Mich.; Miss Nettie McCarn, Champaign, Ill.; M. E. Strout, Portsmouth, N. H.; M. L. Milliken, Augusta, Me.; L. I. Bennen, Baton Rouge, La.; F. E. Dunn, Portsmouth, Va.; G. B. Allison, Rome, Ga.; C. Noble, Norwich, Conn.; J. H. Williams, Stamford, Conn.; Mrs. Hattie Furr, Fulton, Ala.; G. Anderson, McKeesport, Pa.; L. A Anderson, Beardstown, Ill.; W. R. Abel, Jr., Santa Barbara, Cal.; E. N. Johnson, Turlock, Cal.; L. N. Kimmons, High Point, N. C.; E. J. Ferree, Camden, S. C.; Mrs. M. F. Conn, Hammond, Ind.; Miss J. DeSourdy, Jacksonville, Ill.; L. L. Blake, Peabody, Kans.; C. A. Ebert, St. Joseph, Mo.; R. F. Robinson, Granite City, Ill.; A. J. Pittman, Alton, Ill.; E. J. Charnesksy, Ottowa, Ill.; Mrs. J. DeLong, Jackson, Mich.; Miss Cliff Matthews, Brewster, Fla., and P. Grant, Cornelia, Ga.

ALBERT KLEIN, recently manager of the Jacksion, Miss., office, and for many years chief operator of the Birmingham, Ala., office of this company, who recently went to Denver, for the benefit of his health, was improving splendidly when his wife was

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taken ill and died of pneumonia on November 9th. The remains of Mrs. Klein were taken to Memphis, Tenn., her old home, for interment.

G. W. BLANCHARD, aged seventy-one years, well known in telegraph circles in New York, died on November 18th. Mr. Blanchard in the early eighties organized a number of commission telegraph offices which he later turned over to the Postal Telegraph-Cable Company. At the same time he was appointed assistant superintendent of New York branch offices, which position he held until 1898, when he organized the Marine Department of the company. Mr. Blanchard was then placed in charge of the marine service, which position he held until 1907, when he severed his relations with the company to enter other business. He later in the same year returned to the telegraph service, entering the employ of the Western Union Telegraph Company, which position he held until four years ago, when he embarked in the real estate business in New York.

W. C. BLACK, superintendent of the Postal Telegraph-Cable Company, Denver, Col., in a recent letter included this paragraph: "I find that all real good managers and good telegraph men are subscribers and regularly read the TELEGRAPH AND TELEPHONE AGE. It helps make them all what they are—good in their line. John Maxwell, our manager at Lamar, Col., is a good manager and likewise has a little Scotch blood in him. Naturally, he is smart, and being smart, he has been a subscriber to your publication for many years."

M. M. DAVIS, formerly and for many years electrical engineer of the Postal Telegraph-Cable Company, New York, now living in retirement at North Chatham, Mass., writes: "Here's a check to renew my subscription to the publication that is always welcome."

WESTERN UNION TELEGRAPH CO.

J. C. WILLEVER, vice-president in charge of commercial, New York, is making an extensive trip in the Pacific Coast States, visiting all of the principal cities. He is expected to return to New York before the middle of December.

J. P. SPANIER, representative of the company at Naples, Italy, was a New York and Washington visitor during November. He sailed for Europe on the steamer *Adriatic* on November 30th.

G. D. HOOD, superintendent of telegraph of the Chicago, Rock Island and Pacific Railway, Chicago, and E. E. Dildine, superintendent of telegraph, Northern Pacific Railway, St. Paul, Minn., were visitors in the executive offices recently.

P. T. MCNAMARA, assistant apparatus engineer, New York, is making a special trip through Louisiana and Texas.

W. J. JENKINS, of the plant layout engineer's office, New York, was married to Miss E. Harton, of New York, on October 28th.

AT the regular meeting of the Wire Club of New York on November 14th, the following officers were elected for the year 1922: President, Col. I. D. Hough; vice-president, W. R. Lawrence; secretary, Geo. Mittage, and treasurer, W. E. Fleming; board of managers, F. S. O'Connor, chairman, A. C. Gibbs, G. C. Gute, T. M. Brennan, C. H. Howley; auditors, W. O. Ege, H. M. Heffner, E. D. Pitt. In the course of his remarks accepting the presidency of the club, Colonel Hough spoke of the activities for the coming year by referring to the probable consummation of the club's desire to have a home of its own. After the demonstration at the conclusion of his speech he announced the appointment of the following membership committee: M. J. Hayden, M. J. Wallace, V. M. Sozzi, F. C. Licari and R. H. Tucker.

MISS Louise Ankin, T. M. Brennan's able assistant, has returned from her vacation.

MISS Elma Wilson has resigned and returned to her home in Virginia.

MISS Lillian Mahan, time clerk, was married on October 15th.

THE Service Social Club held its annual ball at the McAlpin Hotel recently. To say that the affair was a success would be putting it mildly. Among those attending were Colonel I. D. Hough and J. J. Welch, New York, J. G. Hayes of Chicago, M. Harner, our deputy vice-president, and other noted people. Due thanks should be given Mr. Jablin and Mr. Silverman for the way the affair was handled.

MISS Lillian McLaughlin and Miss Edith Reiner have resigned to take up housekeeping.

MISS Mary Nickson died on October 15th. Miss Nickson was beloved by everyone in the department and her loss will be felt by her associates.

Eastern Division

W. SHEDD, manager at Niagara Falls, is now taking his annual vacation.

CARL B. SCHOOLEY, of Herkimer, N. Y., has been appointed cashier at Utica, N. Y.

DOROTHY M. RANDALL succeeds Viola E. Tylor as cashier at Jamestown, N. Y.

MARIE GRENTZINGER, of Batavia, N. Y., has been appointed acting manager at Canton, N. Y., vice Mrs. L. L. Lamb.

LILLY BURNS, formerly acting manager at Lake Placid, is relieving Manager Boyd, at Gloversville, N. Y.

MISS Zelma Donovan, who was assigned to Tannersville for the summer months, has returned to Cornwall-on-Hudson.

A. H. ALDEN, for many years manager at Tannersville, has resigned.

THE company has secured a new and up-to-date location at Westfield, N. Y., and will move to the new office as soon as the necessary changes are made.

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THE office at New Rochelle is now undergoing extensive renovations.

MISS Ruth Daniels has been assigned to the Plattsburg, N. Y., office, relieving Manager W. K. Foster, who will be absent for two weeks.

J. C. HALE, of Buffalo, N. Y., recently delivered a talk on "Time and How to Make More of It" before business organizations at Oneida and Poughkeepsie. He met with splendid success.

J. P. FITZPATRICK has been appointed chief operator at Halifax, N. S., vice P. E. McLeod.

Central Division

GENERAL Manager A. D. Bradley, of Omaha, accompanied by W. J. Durand, district commercial superintendent, Kansas City, has just completed a tour of inspection through the Third District. They were well pleased with general conditions.

M. B. HITZMAN, manager at Hutchinson, Kans., spent his vacation with relatives in southern Missouri.

N. E. KING, manager at Pratt, Kans., has just returned to duty from a fifteen-day rest at Excelsior Springs, Mo.

DURING the recent American Legion Convention held in Kansas City, many Western Union employees from various points were in attendance, among them being W. C. Fox, manager, Topeka, Kans., and P. A. Kauffman, manager, Joplin, Mo.

J. F. SIMONDS has been appointed chief operator at Topeka, Kansas, vice M. H. Williams.

Orville D. Parker's Golden Anniversary

There is a man in Austin, Texas, who for fifty years has been the storm center of tragedy, business, near-tragedy, love's young dreams and humorous happenings. He is not a gossip, and he does not run an advice to the lovelorn column for a daily paper. He is one of the tightest-mouthed men in Austin, a man whose white head holds secrets that would wreck businesses and homes, yet a man whose very business seals his mouth.

And he is callous to all that. He calmly listens while news of his neighbor's mother's death is brought to him; while markets totter and break; while the tidings of flood and disaster crackle in his office. And yet he is not a hard-hearted man; it is simply all an old, old story to Orville D. Parker.

Mr. Parker is celebrating a golden anniversary, but not his golden wedding day. He is putting a period of fifty years of service with the Western Union Telegraph Company. On November 17th he had been on the Western Union payrolls for half a century—fifty years of continuous service. From a lad of sixteen, fumbling with a wooden telegraph instrument, to a white-haired man of sixty-six years, and manager of the Austin office of the Western Union, Orville D. Parker has traveled those fifty years honorably, even brilliantly.

H. E. WHITE, of Norfolk, Va., has returned to that office after a stay at Roanoke, Va., as acting chief operator until a permanent selection could be made to fill the vacancy caused by the resignation of L. W. Griffith. W. H. Cantrell is now chief operator at Roanoke, as recorded in the previous issue.

WILLIAM J. FLEMING, of Charleston, S. C., who had undergone three operations during the past year, which did not restore him to health, was recently retired on a pension. Mr. Fleming has been with the company continuously for the past fifty-four years. During the earthquake, years ago, and during the yellow fever epidemic which takes us back still further, Mr. Fleming stuck to his post and rendered the company valuable service. Up to two years ago Mr. Fleming was manager of the local Cotton Exchange branch, where he was ever popular with the brokers and buyers. When he was appointed city solicitor two years ago, he secured large files of business and numerous time clocks were installed, the direct result of his "selling talk."

Mr. Fleming was one of the charter members of the local Western Union Employees Association, and it was through his untiring efforts that the Charleston local is at the present time a great success. While we all dislike to see Mr. Fleming leave his daily routine, we are happy to know he will stay in the "old home" town the remainder of his years and pay the office an occasional visit when able to do so.

Death of R. H. Bohle.

Rudolph H. Bohle, aged seventy-one years, for over twenty-five years manager of the Western Union Telegraph Company at St. Louis, Mo., died at his home in that city on November 28th.

Mr. Bohle's entire telegraph career had been spent with the Western Union Telegraph Company at St. Louis, except during the Civil War, when at the age of eleven he became a messenger in the United States military telegraph service. He soon developed into an operator, continuing as such in the military service.

He retired from active business in March, 1913.

Radio Corporation of America

G. H. CLARK, engineer, New York, has returned from a stay of several months in Venezuela.

H. H. BEVERAGE, engineer, New York, sailed for South America via England on the steamer *Aquitania* on November 15th.

W. S. PURSER, assistant traffic manager, and G. S. Whitmore, assistant superintending engineer of the British Marconi Company, London, spent a few days in New York recently, inspecting the plants of the Radio Corporation.

THE fall dance of the Radio Provident Club, New York, which was held at Leslie Hall, West 66th Street, November 17th, was very successful, two hundred being present.

RADIO employees are making their usual preparations for the benefit of the poor at Christmas time. Gifts this year will be mainly food, owing to great numbers of people being out of work.

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Electric Batteries Reverse Voltage at Low Temperatures

When storage batteries or dry cells are cooled down to 170 degrees below zero Centigrated, the temperature of liquid air, these producers of electricity may reverse their voltage. This is the scientifically startling phenomenon that has been discovered at the Bureau of Standards, Department of Commerce, by two physicists, G. W. Vinal and F. W. Altrup, who were making tests to determine the reliability of batteries at arctic temperatures. So far as is known, this is the first time this phenomenon has been observed.

A storage cell of the same material as used on thousands of automobiles every day was gradually cooled down and the open circuit voltages at the various temperatures were determined. Down to 80 degrees below, the voltage remained at the normal value, just as it does in ordinary operation at normal air temperatures. But between 80 and 100 degrees below, after the electrolyte had "undercooled," it increased in temperature slightly as freezing began. The voltage dropped down to nothing at about minus-100 degrees Centigrade and then, at a slightly lower temperature, strangely registered a minus reading. Still more unexpected was the fact that there was registered as high as 10 volts in the direction opposite to the normal voltage. Then the voltage violently fluctuated, ranging from positive ten volts to negative ten volts. These reversals happened whenever the frozen electrolyte of the cell "ticked."

A dry cell of an electric flashlight of commercial grade was given the same cooling treatment, and after giving slightly higher voltages than normal at 115 degrees below, it gradually reduced voltage until at 170 degrees below it reversed its voltage also.

But while the voltages shown under the sub-arctic temperatures are reversed and remarkably large, no hope is held out that storage batteries can be recharged by the simple method of cooling them to the low temperatures used in the Bureau of Standards' tests. The currents at these low temperatures are vanishing small, and practically they hardly exist, the tests showed. Just now the battery charging stations need fear no low-temperature competition.

The low temperature tests were begun to determine whether dry batteries would give reliable voltages at temperatures that would be encountered by the McMillian arctic expedition which recently started northward. The scientists of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, who were co-operating in this expedition, also wished to know whether dry cells were fit for use after being frozen.

Dry cells of both the ordinary type and the silver chloride cells which were also tested at low temperatures appeared to be perfectly normal after being thawed out. The small-sized storage cell used also came through the cold without damage and even the glass test tube that contained it was unbroken. This phase of the tests is likely to prove of considerable commercial importance, as dry cells that are used in cold regions and accidentally frozen can be relied upon, according to the results of the tests.

The knowledge of the behavior of cells at low temperature will prove useful in the case of flying at high altitudes, where temperatures approach those of the arctic regions.

Too Much Talk

It is very unfortunate that progress today depends so much on preliminary oratory. Our very Government is founded on oratory, and the man who can make a rattling good speech, or face any sort of a crowd, and deliver an address on a given subject, is almost sure to make good, whether he knows his subject or not. On the other hand, the capable man who can do things, or get things done, is very often a poor or indifferent speaker, troubled with stage fright and incapable of stringing half a dozen words together effectively when faced with an audience. As a result, there is far too much preliminary speech-making, conferences, and political discussion over every new scheme put forward for the amelioration of our national life.—*London Electricity.*

Telephonic Device to Record Sound of Breath and Heart

Perfection of a device which will record the sound of a human breath or a heart beat on a steel wire from which they can be accurately reproduced at any time is announced by the United States Bureau of Standards. The work was undertaken at the request of the army medical service, which explained that permanent records of unusual conditions of heart and lungs were desired for clinical instruction.

The device comprises the use of an ordinary telephone transmitter and a stethoscope, the current generated by the beat of the heart being "amplified and impressed on a steel wire telegraphone which has the different sounds impressed upon its spool of wire in the form of varying degrees of magnetization."

The Secrets of the Candler System Will Make YOU A MASTER Telegrapher

—able to send better and faster stuff than you have ever sent—able to receive with ease from the fastest senders, turning out high class copy with pen or mill—able to work any fast telegraph job. Nothing else improves expertness with pen, mill and key—nothing else builds a strong, healthy body as quickly, surely and easily as The Candler System. This world-famed system has helped thousands of men and women to become MASTER Telegraphers—full of bodily vigor. Young or old, it is GUARANTEED to do as we say. Write for FREE booklet **"How to Become a High-Speed Telegraph Operator."** It will interest you. A postal will do. Write NOW!

THE CANDLER SYSTEM CO.

Dept. TA, 123 East 45th Street, CHICAGO, ILL.

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CANADIAN

MR. AND MRS. DAVID DRYSDALE, Dorchester Street, Westmount, Que., announce the engagement of their daughter, Alice May, to Eric William Camp, son of Mr. and Mrs. W. J. Camp, of Montreal. The marriage will take place December 3.

Canadian National Telegraphs

NEW REPEATER OFFICE AT HORNEPAYNE, ONTARIO

With the completion of the $100,000 depot at Hornepayne, Ontario, situated approximately six hundred miles northwest of Toronto, and a divisional point of the Canadian National Railways, the Canadian National Telegraphs have opened up one of the finest repeater stations in Canada.

The equipment is the latest in use on high speed automatic circuits, consisting of separately mounted fireproof repeater units with the Canadian National Telegraphs sliding base Wheatstone relay and other special features.

Each repeater unit is equipped with a signalling device operating on a 220-volt local and so arranged that the terminals can call in repeater attendants when required.

These repeaters are in use on the Toronto-Winnipeg and the Montreal-Winnipeg multiplex circuits, also on the Toronto-Port Arthur Morse duplex.

The combination switchboard and operating table in use was specially designed for the Canadian National Telegraphs and consists of the new type pin jacks and voltmeter, mounted on solid slate panels.

A three-bank chloride accumulator, consisting of 110 cells in each bank, serves as power supply, charged by a 350-volt generator at the railway shops, where an up-to-date electrical plant is maintained.

George L. Thompson, formerly assistant plant chief, and Chas. C. Hamilton, formerly automatic supervisor, at Toronto, are looking after the repeater and wire service at this point.

THE Commercial Department held another divisional conference at Toronto on November 9th, of managers from various Ontario offices, and head office representatives. Among those present were: Geo. D. Perry, vice-president and general manager; W. G. Barber, general commercial superintendent; J. G. Davies, district commercial superintendent; R. W. Ball, commercial supervisor; Geo. Hogarth, commercial agent, Toronto, and the following managers: C. W. Dawzy, Toronto; J. Jamieson, Hamilton; R. J. Foster, London; A. C. Hanley, Kingston; A. H. Boomer, Peterborough, and H. Coutts, Brantford. In view of the great enthusiasm displayed, it was decided to hold similar meetings of the commercial forces at certain strategic points once a month.

MEMBERS of the audit office entertained the head office staff and their friends at a masquerade party on the evening of November 4th, when over one hundred guests were present nearly all in fancy dress attire. The spacious office of the audit department, used as the ball room, was gaily and appropriately decorated for the occasion with black and orange bunting, streamers and shades, also ornamented with glowing pumpkins, black cats and witches. Vice-President and General Manager Geo. D. Perry in domino costume was present with Mrs. Perry, and addressed the gathering, to which Mr McConnell suitably replied. Mr. Perry, in his remarks, complimented the audit staff on the success of the event, which was the first of the kind to be held in the company's offices, and expressed the hope that it was merely a forerunner of many similar gatherings in the future. Master of Ceremonies A. C. McConnell was dressed as Simon Legree from Uncle Tom's Cabin, and W. G. Barber appeared in Oriental costume as Chu Chin Chow. R. A. Taylor, dressed as a Canadian National Railway porter (colored), won the gentlemen's first prize, and Miss G. M. Wilton as an Indian maid won the ladies' first prize for best costumes. A feature of the evening was a lucky number dance, in which C. G. Garden and sister were the favored couple. A splendid buffet luncheon, provided by the ladies of the audit office staff, completed a very successful evening.

THE Canadian National Telegraphs recently lost an esteemed and valuable servant in the death of John McWilliams, former manager at Father Point, Que. Mr. McWilliams was born in Quebec City, sixty-seven years ago, and at the age of twenty-two took charge of the Father Point office. In addition to being telegraph manager, Mr. McWilliams held the Mayoralty of Father Point for twenty-five years, agent for the Government Signal Service, and correspondent for prominent Canadian dailies. Early last spring he was taken seriously ill, and after seeking relief in the various hospitals of Quebec Province, finally went to the Douglass Hospital, New York City, where he died. John McWilliams was a man beloved for his many acts of kindness and service, by all with whom he came in contact, and the loss to the community is deeply mourned. A son, David, perpetuating his father's life, is manager for the Canadian National Telegraphs at Quebec City.

THE death of M. J. O'Reilly, who for many years held the position of wire chief with the Canadian National Telegraphs at Quebec, occurred at his home on November 14th. Entering the service of the Montreal Telegraph Company at Quebec City over fifty years ago as a messenger boy, Mr O'Reilly remained throughout the merges with the Great North Western Telegraph Company, and finally the Canadian National Telegraphs. Early this summer he became seriously ill and went to New York for treatment. Alternately rallying and sinking, hopes were, at times, held out for his recovery, until almost the last. Mr. O'Reilly leaves to mourn his loss, a wife, a host of fellow employees, and citizens of Quebec. His willingness with helping hand and jovial manner, will live for many a day in the memory of those with whom he was so popular.

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The Telegrapher's Opportunity.

By P. J. TIERNEY

Many people have found that their early training in the telegraph service was an efficient aid in advancing their personal welfare, and quite a few have climbed to the very apex of successful business careers because of it.

Is there a reason for all this? Are the opportunities for success as numerous today as they were a generation ago? What course should the telegraph employee of today pursue to achieve a successful business career? All this can be solved by a little thought. The first essential is punctuality. The next is dependability. These two beget a spirit of service that creates an atmosphere wherein you will stay on the job yourself, regardless of the clock, until the particular important task you are engaged in is finished. When you get that way it is absolutely certain that although the service your office is rendering today is 100 per cent. efficient, you are going to try tomorrow to make that 100 per cent. glisten a little bit more, and after living in this kind of an atmosphere for a little while, every task you perform will be finished in an absolutely perfect form. You have now achieved a habit that will stick to you all your life. You have absorbed an education and you have learned how to appreciate the value of time, the cutting out of all wasted time and effort, and the necessity for acuracy. Having thus equipped yourself, there is no power on earth that can stop you from being a successful business man.

Obituary

BENNETT A. PRYOR, aged seventy-seven years, died at Santa Rosa, Cal., on November 1st. Mr. Pryor was identified with the Western Union Telegraph service at Reno, Nevada, in the late seventies.

GEORGE O. SMITH, aged seventy-five years, died at Cleveland, Ohio, on November 9th. Mr. Smith was an old time telegrapher and was one of the oldest members of the Telegraph and Telephone Life Insurance Association, his certificate being No. 316.

ALONZO A. ZION, aged seventy-five years, an Old Time and a United States Military Telegrapher during the Civil War, for many years previous to five years ago, when he retired, a railroad official, died at Indianapolis, Ind., on November 12th. Mr. Zion was a messenger under General Grant. When serving watch at the Knoxville railway station, he saved the life of a man suspected of being a Confederate spy, by recourse to his knowledge of telegraphy. Hearing an operator at Chattanooga trying to get the Knoxville station and getting no response, the boy became anxious. Seeking advice of his officers, it was found that the Knoxville operator was absent. Zion then took charge of the key and hurriedly dispatched the message, which was from military headquarters, and cancelled an order for shooting at sunrise the man suspected of being a spy. At the time of his retirement and for over twenty years previously, he was superintendent of the Indianapolis Union Railway Company and the Belt Railroad Company. He was chairman of the Pension Committee of the Society of the United States Military Telegraph Corps for many years.

SAMUEL ALFRED VARLEY, aged ninety years, whose death occurred at London, England, a short time ago, was prominently identified with the telegraph service of England in an official capacity beginning in 1852, until the early nineties, when he embarked in larger electrical pursuits. He was a brother of Cromwell Varley, the leading telegraph engineer of his day.

WILLIAM H. ROLFE, aged fifty-nine years, a telegraph operator on the Associated Press wire of the New London, Conn., *Evening Day* for twenty years, died on November 8th, of paralysis after an illness of several months.

New Mediterranean Cable

A new cable service across the Mediterranean Sea is soon to be established, connecting the ports of Marseille and Philippeville, according to a recent report of Consul Dow at Algiers.

I'LL SAY YOU DID

"Say, Joe, did you ever get a wrong check?"

"Well, possibly so. Smith mailed me a check for amount owed and the bank tagged it 'No funds.'"

SOME OF 'EM DO BUMP US

Casey told Finnegan he heard they were going to hire some phrenologists to test out the trouble in mux heads.

999 COLLECT

"'Smatter, Bill, you look down-hearted."

"Oh, I got the blues."

HUH?

Somebody told somebody that if they ever had a fire in Vice-President Yorke's office it would certainly be a hot house plant.

Smithers had been the victim of many blue tags lately, and appeared very morose. Catching him in a pensive mood, Brown remarked:

"'Smatter Smithy, whadda yer thinking about?"

"Just wondering if I went up to Heaven if they'd tag me 'Returned for Correction'?"

Distant Office: "Call your chief."

Home Operator: "Whadda you want me to call him?"

"Say, Mr. Traffic, how many words is sore finger?"

Traffic: "Believe me, if I had one and hit it, 'twould be several."

The little girl in the Misc got her first Rq, and said:

"R Q was well selected. I think she's asking me a rotten question."

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CONTENTS

The Place of Radio in the Communication Field 560
Honoring Manager Parker of Austin, Texas. Clever Delivery Service. Telephones in the United States and Abroad 562
The Telegraph Facilities in 1853 563
Electric Traction. Fire Alarms by Wireless Planned in Pennsylvania .. 564
Locating Faults in Submarine Cables. By Alexander Cunningham, in The All America Review. Imperial Wireless Scheme 565
New Office at El Paso, Texas. Conference of Western Union Employees at Jacksonville. Retirement of Eugene L. Dyer 566
A Civil War Episode. By David Homer Bates 567
Success of Wireless Telephony. Old Time Telegraphers' and Historical Association 568
Student's Course in Technical Telegraphy. By Louis Casper. Lesson 41 569
Southern Telegraph Reminiscence. By "N" 571
Editorial—New Year Resolutions. Flashlight Telegraph Service. The Electrical Review. Telegraph and Telephone Life Insurance Association. Rules of Business 572
The Railroad—Telegraph and Telephone Section of the American Railway Association 575
J. C. Browne Becomes Superintendent of Telegraph of the Missouri Pacific System. The Louisville and Nashville Right of Way 576
All America Cables Staff Dinner. Radio Corporation of America 577
E. J. Nally Elected Vice-President, Marconi Sports Club of London. Westinghouse to Cover United States by Wireless. Telephone Society of Boston, Mass. 578
Personal. Postal Telegraph-Cable Company 579
Praise for the Plant Department. Commercial Cable Company. Serial Building Loan and Savings Institution 580
Western Union Telegraph Company 581
The Late R. H. Bohle. By J. Frank Howell, New York. Electrical Aid Society of Philadelphia. Canadian. Obituary 582

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The Place of Radio in the Communications Field

It has been the policy of the Bell System to build a telephone plant which would give universal service of the highest possible quality. In building up the nation-wide plant required to give service to the people in all parts of the United States, the solution of the technical problems arising in the business have at all times been undertaken in accordance with the thorough methods of scientific research. The scientific laboratories of the Bell System, which sprang from a tiny work room with but two workers, have grown until they employ 2,800 persons. In these laboratories—the largest industrial laboratories ever devoted to the application of science to human affairs—not only has no effort been spared to develop wire transmission, but also the most careful examination has been made of every other recognized means of transmitting the human voice, especially the radio or wireless telephone. By the development of many different radio methods and systems, and the design and construction of different types of radio equipment during the past decade, the staff of the Bell laboratories has made numerous and very fundamental additions to the knowledge of this method of communication.

In this connection it may be pointed out that the first transmission of speech by means of electromagnetic waves was accomplished by Alexander Graham Bell in 1880 with his so-called radiophone. Instead of employing the long wave lengths with which wireless messages are today transmitted, this device made use of the very short waves of the visible spectrum, a beam of light being varied in intensity in accordance with the variations of the speech waves

Turning to a consideration of the modern development of the radio art, it will be recalled that the engineers of the Bell System transmitted speech by wireless telephone from Arlington, Virginia, to Paris and Honolulu in the autumn of 1915, thereby establishing the historic record for American engineers of being first to transmit the voice across the Atlantic Ocean. Furthermore, in transmitting the voice to Honolulu a long-distance record was achieved which has not yet been equaled by others.

The Bell engineers had a notable part in solving the many radio problems which arose during the recent war, and designed many types of radio equipment for the American forces both for communicating with ships and with airplanes.

No commercial uses have yet been made of the company's transoceanic telephone development because of the many practical difficulties which are involved in the application of radio, chief among which are the disturbances due to "static" and other interferences.

More recently, the first two wireless telephone stations available for public use have been erected on the California coast. These stations supply every-day telephone service betwen the Island of Santa Catalina and the mainland, and are an integral part of the Bell System, so that a subscriber on the Island can call any number in Los Angeles, or in fact any number throughout the entire Bell System. A submarine cable would give better and more economical service to the Island than the radio telephone, but manufacturing conditions growing out of the war were such that this cable could not have been obtained within the time desired. In view of this fact, together with the fact that the installation of a wireless system would provide valuable experience regarding the use of the radio telephone in rendering commercial service, the decision was made in favor of the radio system.

The company has also performed extensive investigations into the matter of ship-to-shore telephony. For a year past, an experimental equipment has been maintaind by the Bell engineers on the steamships *Gloucester* and *Ontario* in conjunction with their radio stations on the Massachusetts coast and on the New Jersey coast. Utilizing these experimental stations, they have conducted practical scientific investigations into the best methods of maintaining communication between ships at sea and the wire plant of the Bell System throughout the United States.

The progress made in this work is well illustrated by a demonstration given lately in honor of the delegates to the International Communications Conference, during which conversation was exchanged between Catalina in the Pacific Ocean and the steamship *Gloucester* in the Atlantic. Speech was transmitted by radio telephone from the *Gloucester* through the New Jersey station, and thence by wire across the continent to Los Angeles, and thence by radio telephone to Catalina. More recently apparatus has been developed whereby a single land station can maintain a different two-way conversation with each of three ships at the same time.

Still another achievement fresh in the mind is the joining of the overland wire circuit from Key West to Los Angeles with the new submarine telephone cable to Cuba and with the radio telephone to Catalina, to the end that speech was transmitted between an island in the Atlantic and an island in the Pacific.

The extensive experience of the Bell engineers in trans-oceanic and ship-to-shore radio telephony and in supplying commercial radio telephone service on the Pacific coast, has provided trustworthy data whereby they can judge concerning the practicability of radio in the various fields in which it might be applied. Their studies show that the characteristics of wireless transmission are such as to make it particularly useful as a means of supplementing the wire systems in those instances where, from the nature of the case, it is impossible or impracticable to employ wires.

Thus the broadcasting of information of general interest over land and water is a service which cannot well be rendered by wires and for which radio, with its messages carried in all directions at the same time, is exactly suited. The broadcast distribution of time signals and weather and market reports to mariners, farmers and the like, and the simultaneous dissemination over a wide area of im-

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portant items of news is likely, as time goes on, to become one of the most important uses of radio communication in which both the radio telegraph and telephone will play their respective parts. For these purposes, the fact that the messages can be picked up by all who have proper receiving stations, is a decided advantage.

On the contrary, however, when radio messages are intended only for certain stations, the fact that they spread out in all directions, causing lack of secrecy, is a defect. For the distribution of press dispatches, intended only for particular stations, radio could not be employed unless some method of preventing the reading of messages at unauthorized stations is obtained.

In the transmission of news, speed is an essential factor, and while it is not impossible at the present time to put news dispatches in cipher by ordinary methods, the time required for enciphering and deciphering makes these methods objectionable. Accordingly, the Bell research laboratories have worked on the problem of applying to radio telegraphy the quick cipher or secret method of wire telegraphy which their engineers developed and which was used with marked success upon wires by the Signal Corps during the war. It is a secret means of telegraph communication, and while the ciphered message may be heard at all radio stations, it can be interpreted only by those who have the cipher apparatus and key. This instantaneously enciphers the message at the sending end and deciphers it at the receiving end, where it appears immediately in printed page form ready for use. The work done upon this system of secret telegraphy by the engineers of the Bell System promises to be generally available and for the benefit of radio telegraphy.

The Bell engineers have also attacked the problem of privacy in radio telephony and have given an experimental demonstration of a method which they have devised, whereby ordinary receiving stations can hear nothing but unintelligible sounds; yet at all stations equipped with the necessary apparatus and in possession of the requisite operating information, the spoken words can be understood.

Before the advent of radio, there was no very effective means of communicating with ships and other moving stations, and it is by virtue of the inherent characteristic of all radio messages—that they spread out in all directions—that the wireless telegraph has greatly increased the safety of travel at sea, becoming a blessing to the mariner and to those who entrust themselves to his care.

In the future, it is expected that the wireless telephone will also play an important part in this field in which the wireless telegraph is now of inestimable value. As noted above, the developments necessary to this end have been carried well toward completion by the Bell engineers, and when certain problems, largely commercial in their nature, which are peculiar to ship-to-shore telephony, are disposed of, the wireless telephone will serve to put ships in communication with the telephone lines on land to the same extent that the Island of Catalina is now connected to these lines.

In addition to its uses in navigation, the wireless telegraph has taken its place beside the submarine cable as a means of transoceanic communication. In this field, the wireless telephone is expected to play its part, for while it is possible to signal by telegraph through the transoceanic submarine cables, it is not possible to talk through them.

The wireless telegraph finds its best field across large bodies of water, such as the Atlantic and Pacific Oceans, where the only wire communication possible is by means of submarine cables. The rate at which messages may be transmitted over ocean cables is very slow compared with the rate attainable on land cables of the same length. Across the oceans the relative advantages of the cable and the radio are difficult to appraise. Each has advantages over the other, and each has its disadvantages, and each is successfully carrying its share of the international telegraph traffic of the world.

While the radio telegraph does not function as successfully over large areas of land as over corresponding areas of water, the telegraph wire cable over land is vastly more efficient than is the submarine cable of an equal length. The submarine cable consists of one conductor, whereas the land cable, although less than three inchs in diameter, may carry as many as 600 conductors. Such a cable, when constructed and operated in accordance with the latest scientific discoveries, can be made to carry over 5,000 telegraph messages at one time, as compared with only two messages carried at one time by the submarine cable.

While the number of land cables may be increased without limit and can carry traffic far in excess of that which ever will be required, the number of messages which radio can carry at one time is distinctly limited, due to the fact that each radio message tends to spread out in all directions, thus traveling through the same region in which many other messages are traveling. As has been aptly said, the ether is a universal party line constituting a single conductor which must be used in common by all the world. Although ingenious methods have been devised whereby the number of simultaneous radio messages may be largely increased, the ether can at best carry only a small portion of the total world traffic. The best field of radio is for long-distance transoceanic communication, for broadcasting, for the radio compass and for auxiliary radio fog signals given out by lighthouses, for innumerable military and naval purposes, and for transmitting messages to and from moving stations and between places where wires are not available. When all of these necessary services are fully provided for, the capacity of the ether for conveying messages simultaneously without interference will be taxed to the limit.

Thus the characteristics of radio messages, causing them to spread out over large areas and enabling radio to be of inestimable service in certain fields, stand in the way of its extensive use on land where it is possible to provide wires which are nothing more nor less than pathways for guiding

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or directing the electric waves in the ether between any desired points, however numerous they may be or wherever they may be situated. By means of these wire guides, millions upon millions of messages may be carried simultaneously without interference with each other. It has often been said that, had the course of scientific development been reversed so that radio transmission preceded transmission by wire, the discovery that wires can be used to guide the ether waves would be considered one of the marvels of science. By their use, the otherwise uncontrolled ether waves are caused to follow any predetermined pathways, flashing thousands of messages to and fro under our city streets without the slightest interference, each message following its allotted course, whether up through the intricate structure of a thirty-story office building, or out across the plains, under rivers and over mountains, to the far side of the continent, there to be received by him—and him alone—for whom it is intended.

The natural characteristics of radio and wire transmission are, therefore, fundamentally different. Each, due to its unique capabilities, is performing a service for which the other is unsuited, and each is supplementing the other to the end that all important needs for communication are being provided for as rapidly as they arise. For the large amounts of traffic on land, both telegraph and telephone, which must be handled with certainty and a minimum of cost, the use of wires is necessary. But as an agency for communicating over wide stretches of water, with moving conveyances generally, for a host of maritime and military purposes, and for the broadcasting of information, radio today is rendering services of the greatest value, and all considerations point to the conclusion that in these fields its use will become of ever greater importance.

———o———

The Most Sought After Electrical Book on the Market

"Pocket Edition of Diagrams and Complete Information for Telegraph Engineers and Students," by Willis H. Jones, offers the most complete study of the telegraph ever published. This standard text-book has been revised and brought up to date, and in addition to numerous diagrams and complete information covering the study of the telegraph, includes full descriptions of the newest apparatus adopted by the Western Union and Postal Telegraph companies, and describes the equipment of a modern telegraph office. This valuable book, with its 488 pages, 250 illustrations, and carrying an appendix of 24 pages and 16 illustrations covering the new Western Union Multiplex System, is the most sought after electrical book on the market. $2.50 per copy. Address and make remittances to TELEGRAPH AND TELEPHONE AGE, 253 Broadway, New York.—Advertisement.

Honoring Manager Parker of Austin, Texas

In our previous issue, we printed a paragraph announcing the Golden Anniversary of Orville D. Parker, manager of the Western Union Telegraph Company at Austin, Texas. Fifty years with his employing interests is a long stretch in the life of an ordinary man, but Mr. Parker is unusually active and enterprising and gives promise of serving the telegraph interests for many more years to come. Mr. Parker was born at Savannah, Ga., December 20, 1855, and learned telegraphy when sixteen years of age. He took the Associated Press report at Pensacola, Fla., in 1882, and was made manager of the Denison, Texas, office in 1883. This position he held until 1892, when he was made manager of the Austin office, which place he has retained to the present time. He is one of the outstanding men of Austin, one of the dependable, worth-while citizens that have been responsible for Austin's growth and for her reputation as the home of substantial "nice" people.

And so, with fifty years of honorable service behind him, thousands of Mr. Parker's friends in Austin and the high officials of the Western Union Company heartily congratulate and commend him on this golden anniversary of his, in wishing him another half century of happy and successful life, if he wishes to live that long.

———o———

Clever Delivery Service

Manager J. Baptiste, of the Western Union Telegraph Company's branch office at 848 Eleventh Avenue, New York, recently received two messages at his office filed at Central Islip, L. I., N. Y., addressed to the friends of William Dorsey, one bearing the address, 524 West 57th Street and the other, 823 Tenth Avenue, announcing his death. The messenger boys made diligent inquiries of every family living at these addresses, but no one acknowledged being acquainted with the man. Manager Baptiste, believing that someone would be interested in the information, personally called on several storekeepers in the neighborhood. An undertaker was found who admitted knowing the man and promised to make an effort to locate his sister, who at one time lived in the vicinity. He said that in the event of his inability to do so, he would take care of the burial as a mark of friendship.

Through diligent inquiry it was ascertained that Mr. Dorsey had a sister living in Keansburg, N. J. She was communicated with and was glad to arrange for her brother's burial. The sister warmly congratulated Manager Baptiste in locating her.

———o———

Telephones in the United States and Abroad

The total number of telephones in Europe is approximately 4,880,000, or one to each eighty-two inhabitants. Of these, 3,870,000 are in Sweden, Norway, Denmark, Germany, Austria, Switzerland, Holland, Belgium and Great Britain. The United States had 12,668,700 telephones in 1919.

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The Telegraph Facilities in 1853

In the "Electro-Magnetic Telegraph," a book of 264 pages, printed in March, 1853, at Philadelphia, under the authorship of Laurence Turnbull, an account is given of the consolidation of the numerous telegraph companies then in existence. We print the matter in full, as it appeared in the book because it enumerates all of the telegraph companies, their mileage, etc. It also refers to the first repeater ever used for telegraphic purposes. The matter reads as follows:

The lines of the Rhode Island Telegraph Company, extending from Worcester to Providence, Fall River, Taunton, New Bedford, Warren and Bristol, have been sold to the New York and New England Union Telegraph, which is the Morse and Bain Line united. The price paid was $5,000. The cost of the lines sold, including the patent, was about $20,000.

Merchants' Telegraph Company, from New York to Boston, about 250 miles; two wires passing through Providence, using Bain's patent.

Boston and Portland Telegraph Company, from Boston to Portland, 100 miles; one wire, using Morse's patent.

The Merchants' Telegraph Company have one wire from Boston to Portland, 100 miles, Bain's patent.

The New York and Boston Telegraph Company, and Merchants' Telegraph Company, between New York and Boston, have consolidated and formed one company under the title of New York and New England Union Telegraph Company; Boston and Portland are also included in the new company, which extends from New York to Portland.

Maine Telegraph Company, from Portland to Calais, Maine, about 306 miles; one wire, Morse's patent.

St. Johns and Halifax line, from Calais to Halifax, about 400 miles; one wire, Morse's patent.

There is a line of Bain Telegraph from Boston through New Hampshire to Burlington, Vt., thence to Ogdensburg, New York; about 350 miles; one wire.

New York, Albany and Buffalo line, from New York to Buffalo, through Albany and Troy; 513 miles long; three wires, using Morse's patent.

New York State Telegraph Company, from New York to Buffalo, via Albany; two wires; 550 miles long; with a branch from Syracuse to Ogdensburg, via Oswego; about 150 miles; one wire; also a branch from Troy to Saratoga, 36 miles; one wire; use Bain's patent. There is also a Morse line from Syracuse to Oswego, about 40 miles.

House Telegraph Company, from New York to Buffalo, via Albany; 550 miles; two wires; use House's patent.

New York and Erie Telegraph, from New York to Dunkirk, via Newburgh, Binghamton and Ithaca; 440 miles; one wire, Morse's patent.

New York and Erie Telegraph, for railroad use, along the line of New York and Erie Railroad; 460 miles; Morse's patent.

Magnetic Telegraph Company, from New York to Washington, via Philadelphia; seven wires; 260 miles; Morse's patent.

House line from New York to Philadelphia; 100 miles; one wire; House's patent.

Troy and Canada Junction Telegraph Company, from Troy to Montreal, through Burlington, Vt.; 260 miles; one wire; Morse's patent.

Erie and Michigan Telegraph Company, from Buffalo to Milwaukee, via Cleveland, Detroit and Chicago; one wire all the way; second wire from Buffalo to Cleveland; 800 miles long; Morse's patent.

Cleveland and Cincinnati Telegraph Company, from Cleveland to Cincinnati; 250 miles long; two wires; Morse's patent.

Cincinnati to St. Louis, via Indianapolis; 400 miles long; one wire; Morse's patent.

Cleveland and Pittsburgh Telegraph Company, from Cleveland to Pittsburgh; 150 miles; one wire; Morse's patent.

Cleveland and Zanesville line, from Cleveland to Zanesville, 150 miles; one wire; Morse's patent.

Lake Erie Telegraph Company, from Buffalo to Detroit, via Cleveland; 400 miles; one wire; Morse's instrument, built under O'Reilly's contract with Morse, with branch from Cleveland to Pittsburgh, 150 miles; one wire.

Cincinnati and Sandusky City line, about 200 miles long; one wire; Morse's patent.

Toledo to Terre Haute, via Fort Wayne; about 300 miles; one wire; Morse's patent.

Chicago to Dayton, one wire; Morse's line.

Chicago to St. Louis, via Peoria, about 400 miles; one wire; Morse's patent.

Milwaukee to Green Bay; 200 miles; one wire; Morse's patent.

Milwaukee to Galena, via Madison, about 250 miles; one wire; Morse's patent.

Chicago to Janesville; one wire; Morse's patent.

Buffalo and Canada Junction Telegraph Company, from Buffalo to Lewiston; one wire; connecting with a wire in Canada that runs to Toronto, about 200 miles.

There are three companies, if not four, owning the line from Boston to Halifax; from Portland to Calais, Maine, one company using the Morse instrument; from Calais to Halifax, the Morse instrument is used; the line in each province is owned by separate companies, organized under charters from their respective legislatures.

The first American telegraphic line was established in May, 1844, between Washington and Baltimore, over a length of 40 miles.

The line from Washington to Baltimore was then extended to Philadelphia and New York, over a distance of 250 miles. It reached Boston in 1845, and became the great line of the North, from which branched two others: one, the length of 1,000 miles, from Philadelphia to Harrisburg, Lancaster, Pittsburgh, Columbus, Cincinnati, Louisville, Ky., and St. Louis, Mo.; the other, the length of 1,300 miles, from New York to Albany, Troy, Utica, Rochester,

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Buffalo, Erie, Cleveland, Ohio, Chicago, Ill., and Milwaukee, Wis.

A fourth line goes from Buffalo to Lockport, Queenstown, the Lakes Ontario and Erie, the Cataract of Niagara, Toronto, Kingston, Montreal, Quebec, Halifax and the Atlantic Ocean, over an extent of 1,395 miles.

Two lines south; one from Cleveland to New Orleans, by Cincinnati; the other from Washington to New Orleans, by Fredericksburg, Charleston, Savannah and Mobile. The first is 1,200 miles long, the second 1,700 miles. This line has been extended west to Independence, Mo.

The entire length of the line from New York to New Orleans, via Charleston, Savannah and Mobile, is 1,966 miles; and this distance was not worked in one circuit, nor can it be with either of the existing systems with the best mode of insulating in use. The only instance of direct communication was secured by dividing the line into several circuits, probably five or six, and connecting those circuits through the agency of an instrument termed a connector, the effect of which is to cause one circuit to work the other through the entire line in one circuit. The connector (now known as a repeater) is an instrument first invented and applied by E. Cornell, Esq., of New York, on the New York, Albany and Buffalo line at Auburn, N. Y., to work a branch line from Auburn to Ithaca, for the purpose of taking news reports at Ithaca; at the same time they were being transmitted from New York to Buffalo on the main line; this was adopted in the year 1846; it was found to work admirably, and he afterwards modified it so as to make it applicable to working both way in a main line, or, in other words, to make it capable of working a number of series of circuits in a main line; the instrument was adopted for this purpose on the New York and Erie and Erie and Michigan Lines, in the year 1848, and has been in constant use ever since; by it they having frequently worked direct from New York to Milwaukee, 1,300 miles. The instrument is used on the New Orleans line. It was adopted by Charles Bulkley, the then superintendent of the line, who claims it as his invention, made in 1850 or 1851.

The greatest distance that Mr. Cornell has known any lines to work in one circuit, was from Boston to Montreal, via New York, Buffalo and Toronto, a distance of about 1,500 miles. This, however, was done when the earth was frozen, and the lines thus insulated by the frost much better than man has yet contrived to insulate them without its aid. There are no lines working successfully in one circuit more than 550 miles. Lines may be so insulated as to work in one circuit under favorable states of the atmosphere from 800 to 1,000 miles.

In life, as in a football game, the principle to follow is: "Don't cry, don't shirk; but hit the line hard."

Electric Traction

A recent announcement states that in the United States alone electric railways cover a trackage of 44,000 miles and represent a capital investment of approximately $5,000,000,000, while 300,000 men are employed and over 14,000,000,000 passengers are carried annually—ten times as many as are carried by the steam railroads of the country.

In addition, there is the like class of roads in foreign countries, and thousands of miles of trunk lines here and abroad which are electrically operated or for which electrical equipment is planned. This is a brief epitome of one of the most astounding of industrial growths, the product of but a third of a century of effort, writes Frank J. Sprague, in a lengthy article printed in the *Journal of the Franklin Institute*.

In accepting the invitation to present a paper reviewing this great development, I cannot but feel something of that embarrassment which must unavoidably attend the presentation of facts which, if stated correctly from a historical standpoint, must include something of one's personal contributions, especially as one must lack that true perspective for which time, distance and the impersonality of an historian are essential. But, to quote a distinguished predecessor, reminiscence is one of the privileges of advancing years and an accumulation of experience, and is sometimes permitted by a kindly audience.

The history of the electric railway may be considered as covering various periods—such as, the inception of basic principles, the early crude experiments, the invention and evolution of the dynamo-electric machine, the discovery of the principle of self-excitation and the reversibility of function, the scattered attempts at commercial operation, the advent of the modern trolley, the succeeding technical and commercial developments, trunk-line operation and future possibilities.

Fire Alarms by Wireless Planned in Pennsylvania

Wireless telephone stations will be installed in all volunteer engine company houses in Allegheny County, Pa., and in the city fire department, Fire Marshal Thomas L. Pfarr announced recently, after a station had been set up in his private office and its usefulness was demonstrated.

Immediate communication throughout the Pittsburgh district and the county can be had with the wireless 'phones in case of serious fires, the marshal said, and he added that he would equip his automobile with wireless apparatus, so that he would be informed of fires in any part of his district while making inspection tours.

Few men get clear to the top of life on an elevator.

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Locating Faults in Submarine Cables

By ALEXANDER CUNNINGHAM, in "The All America Review"

To understand the means employed in finding the position of a break in a submarine cable it is necessary to have some idea of the nature of "ohms" and "microfarads." These are the electrical units used in measuring a cable. Every cable, both before and after being laid, is very carefully tested and its measurements in ohms per mile and microfarads per mile are recorded. The "ohm" is the standard of resistance, and in order to obtain a measurement in ohms, the cable circuit, whether faulty or otherwise, must be such that a current will circulate from the battery at the testing station through the cable and back again to the battery. This flow of current will only occur when the conducting copper core at the distant end of the cable, or at the break, and one end of the home testing battery are connected to ground. The microfarad is a standard of capacity; it is a measurement of the amount of electricity a cable can hold with the distant end free. It can only be ascertained when the copper core at the distant end of the cable is free; that is, when the distant end is altogether free from any connection with ground. It should be noted here that connection with salt water makes a good ground. The necessity for these two standards of measurement is readily understood when we consider the different conditions under which a fault may develop. If the broken end is to ground, we must test for ohms; if free, as when it parts within the insulating cover, we test for microfarads.

Take the simplest form of interruption. This is where the copper conductor at the fault is making a good ground—that is, a large surface of the conductor is in contact with the salt water or with the outer sheathing wire. In this case the testing station is confronted with nothing more formidable than measuring the ohms between the station and the break. Suppose this reading on the testing galvanometer shows 2,000 ohms and the recorded value for the cable is 5 per mile; by simple division this places the break 400 miles along the line of cable. The position is, of course, very carefully charted during the laying, so the repair ship can proceed straight to the trouble point and make repairs.

Very few interruptions, unfortunately, are as simple as the foregoing. When the broken end is entirely clear of any ground, as occurs when the conducting core parts within the insulation, we can use the microfarad test. Between these two cases of complete ground and no ground there are many intermediate conditions.

The worst of these cases is where there is neither a steady ground nor a steady insulation at the fault; and this occurs frequently.

Take for instance, where only a minute part of the conductor is exposed to the salt water. Such a fault occurs when the small teredo worm bores its pin-hole passage through the outer sheathing and protecting insulating material and exposes a pinpoint of the conductor to the water. Upon putting the test current to the cable we at first get a ground, but before we are able to complete the ohms test, bubbles are formed, through electro-chemical action, which completely shut off the water, and therefore the ground, from the conductor; this condition again will not continue long enough to allow for the microfarad test and it oftentimes takes a great deal of time, patience and experience before the final localization of the fault.

Imperial Wireless Scheme

The Post Office scheme for the erection of an Imperial chain of wireless telegraph stations 2,000 miles apart, to embrace the whole Empire, is reported to have collapsed because of the refusal of Winston Churchill to have anything to do with it. According to the *Westminster Gazette*, in this attitude the Secretary of State for the Colonies is supported by Sir James Stevenson, business adviser to the Colonial Office, and Dr. Eccles, the Government expert on wireless telegraphy.

At the recent Conference of Dominion Prime Ministers the official scheme was received with aloofness, and the Cabinet appointed a sub-committee, comprising Winston Churchill, Mr. Kellaway (Postmaster-General), and Sir Robert Horne Chancellor of the Exchequer).

Mr. Churchill, who was also chairman of the Imperial Communications Committee, definitely rejected the scheme. Sir Robert Horne, with Mr. Kellaway, agreed to go on with it very slowly—the former on the grounds of finance, the latter because, as Postmaster-General, he did not want the Post Office to lose its hold upon wireless communications. Later, when the wireless advisers were forced to admit that the Post Office proposals were out of date, the matter was finally settled. An alternative proposal has been put forward by Robert Donald, chairman of the Empire Press Union. He advocates the formation of an All-Empire Wireless Board on the lines of the Pacific Cable Board, which has one cable owned jointly by the Governments of Great Britain, Australia, New Zealand and Canada.

There would be this difference: The Imperial Wireless Board would be organized as a commercial company—not as a Government department. This would mean that the company would be organized as a commercial company. This alternative plan has the support of some of the Government wireless advisers, including Sir James Stevenson and Dr. Eccles.—*London Electrical Review.*

Australia Wireless Telegraphy

The Amalgamated Wireless Company is arranging to establish a direct service between Australia and England, conjointly with the Commonwealth Government, and is promising a 50 per cent. reduction on present cable charges for all classes of messages.

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New Office at El Paso, Texas

The new office of the Western Union Telegraph Company in El Paso, Texas, was cut over November 19th. The new quarters are located in the First Mortgage Company's building recently erected at the corner of Sheldon and Oregon Streets.

The entire 15th floor is occupied by the operating, testing and regulating, and bookkeeping departments. The telephone room, schools and operators' quarters are on the 14th floor. The commercial office occupies the corner of the ground floor and in the basement are messengers' quarters and storage space.

The operating room is well lighted and ventilated by windows on all four sides. There are seven terminal automatic sets and thirty-eight Morse positions. Belt conveyor equipment of the latest type facilitates prompt handling of traffic to and from the routing center near the middle of the room.

In the testing and regulating department are five universal duplex repeater sets, three rotary repeaters, two of which are on notably long circuits, the first and second New York-Los Angeles multiplex circuits, and two 11- foot repeater tables equipped with quads, terminal duplex sets, time repeaters, single line repeaters, half-sets, etc.

The switchboard is of the pin jack type, and consists of two main line sections and one section for loops and time service.

The various telegraph potentials are obtained from nine motor generator sets. Motor blowers for pneumatic tubes are mounted on a separate bench in line with the motor generator sets. Tubes have been installed to connect the operating room with the commercial office, telephone room and wire chief's desk.

Charles Vollertsen is chief operator. Most of the division officials were present at the opening of the new office, including F. A. Mohr, general manager of the Gulf Division; B. P. Hancock, division traffic superintendent; J. G. Hilbert, division plant superintendent, all of Dallas; S. R. Crowder, general layout engineer, of New York, and many others.

Conference of Western Union Employees at Jacksonville

A three-day conference of Western Union Telegraph Company employees was held at the Seminole Hotel, Jacksonville, Fla., on November 18, 19 and 20, between officials of the company and managers of various offices in the State of Florida.

Those present were: A. C. Kaufman, of New York, general commercial agent; H. W. Griffis, Atlanta, Ga., division commercial agent; L. J. Maxwell, Jacksonville, district commercial superintendent; G. T. Butts, district commercial agent, and Managers M. H. Lines, Jacksonville; J. W. Atkins, Key West; W. A. Moore, Miami; Jack Landon, Tampa; M. H. Luff, Pensacola; C. K. Sage, Ocala; E. G. Hyder, Orlando; W. P. Smoot, West Palm Beach; N. Trent, Tallahassee; R. A. Wiley, St. Augustine; G. A. Maxwell, Fort Myers; Miss Weeks, branch manager, Jacksonville; Miss Lee, branch manager, Jacksonville; R. C. MacQuarrie, commercial agent, Jacksonville; Jas. Pastorious, commercial agent, Miami; W. W. Duke, district commercial manager; C. V. Franklin, relief manager, and E. A. Arnett, relief manager.

During the conference and on the program were several important papers dealing with the needs of the service in the State. While the discussions were confined more or less to technical subjects, or those with a direct bearing on the operation of the telegraph lines of the State, it was plainly brought out that during the last few years the telegraph has become a more important factor in the general run of commerce than ever before and is now employed extensively by business houses for building greater sales and for developing new territory.

Rates, service of all classes, and efficiency were among the subjects handled at the meeting. The various managers addressed the meeting on general conditions in their immediate vicinity, and forecast for the next six months. The visiting officials addressed the meeting on subjects of interest to all, after which a round-table discussion was held.

Retirement of Eugene L. Dyer

Eugene L. Dyer, who at his own request recently retired from the management of the Western Union Telegraph Co. at Lafayette, Ind., removes from the service of that company one of the best known managers in Indiana.

Appreciation of his loyal and efficient service to the company has been expressed by many of the telegraph company officials, including General Manager A. C. Cronkhite, of Chicago, and District Commercial Superintendent E. Boening, of Detroit. In their letters these officials highly praise the work of Mr. Dyer, declaring it to have been of a high order and entitling him to grateful acknowledgment.

Mr. Dyer, who was born at Cloverdale, Putnam County, in 1858, learned telegraphy at Bainbridge, where his father was for fifty years the Monon railroad agent and operator. Mr. Dyer abandoning the railroad service in 1878, entered the employ of the Western Union Telegraph Company as operator. H. E. Doolittle was the manager of the Lafayette office then. Upon the death of Mr. Doolittle in 1894, Mr. Dyer was appointed manager. He has held the position continuously ever since.

Mr. Dyer is prominent in many organizations. He is held in the highest esteem in Lafayette as well as in the entire Western Union system. In relinquishing his duties he said: "I want to express my appreciation of the patronage of business men and the general public of Lafayette, and also of the co-operation which I have received from my fellow workers in the Western Union. I bespeak for my successor, C E. Enyart, the same generous measure of patronage and good will."

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A Civil War Episode

By DAVID HOMER BATES,
Secretary of the Society of the U. S. Military Telegraph Corps

In the Standard Dictionary appears the following definition:

"Louse, *n.* (Lice, *pl.*). A small anoplurous insect, parasitic on and sucking the blood of mammals."

During the Civil War there was a large increase in the crop of small insects such as are here described and we have authentic evidence that the Confederate as well as the Union soldiers furnished food for the little animals, the Greek derivation of one of whose descriptive titles indicates that they are "unarmed and without tails."

This derivation must have become changed in the translation, because it is well known that a louse is armed with a proboscis to pierce the skin and a poisonous sucker to draw the blood of mammals who are not armor-proof.

The Confederate Government embodied the "gray-back," as he is sometimes called in one of their secret cipher codes, as will be shown by reference to the official records of their State Department.

The character in question appears in a cipher communication addressed to Judah P. Benjamin, Richmond, Virginia, dated December 18, 1863. See my article entitled "A Rebel Cipher Dispatch," in *Harper's Magazine*, June, 1918.

During the Civil War the wires of the United States Military Telegraph were carried forward well to the front of our lines in each direction, so that constant communication could be had between the War Department and the headquarters of each Army Corps in the field.

In the case of the Army of the Potomac, the principal line of communication for many months was along the Orange and Alexandria Railroad, and the name of Brandy Station on that road will be recalled by many as having been the headquarters of the Union forces at different periods. The telegraph operators at the front were always eager to visit Washington and when there were no important military movements, this privilege was freely extended.

On one occasion in 1863 the night operator at Brandy Station was granted permission to come to Washington, and after he had left on the morning train the day operator called the War Department office by repeating the signal "D. I." several times in succession, and upon receiving a response asked that I should come to the key. Thereupon he told me that he was anxious to be transfererd to some other office or else the other operator who was on his way to see me should be sent elsewhere.

No special reason was given for making the request, except that they did not get along very well together. But when I inquired more closely, he said that he had observed the other man scratching himself frequently, and he was sure that he was suffering from the presence of army lice; in fact, he himself had found some in his clothes and he knew they had come from his comrade. I promised to attend to the matter when his comrade came and if agreeable to him would make the exchange.

A few hours later the operator arrived, and taking me to one side, where we could talk privately, he made precisely the same request his comrade had already made and gave the same reasons. In fact, he said the other operator was afflicted so badly that he must be transferred to some other office or he would resign. But he cautioned me not to let the operator know the reason for the change, as he did not wish to hurt his feelings. Whereupon I thought it advisable to tell him of the other's request, adding that as they both seemed to be equally guilty, the best plan would be to undergo a simultaneous thorough cleaning up and continue their joint service at Brandy Station as good loyal comrades. This he agreed to do and we then called up Brandy Station and gave him our version and my advice, which after a good hearty laugh (by telegraph) he also said he would follow.

At our reunion in 1915 at the Broadway Central Hotel in New York I told the foregoing to an interested audience, whereupon one of the number (since deceased) arose and said:

"Mr. Bates, you may not remember, but I was the operator who came from Brandy Station to see you. The other operator is now living in Colorado. He may not care to have me mention his name."

Entertainment of the New York Telegraphers' Aid Society

The forty-first annual entertainment and reception of the New York Telegraphers' Aid Society took place on Friday evening, December 2nd, at Palm Garden, New York, and notwithstanding the inclement weather, the spacious hall was crowded with members of the telegraphic fraternity of Greater New York.

The entertainment was of the usual high order which has given this annual occasion a splendid reputation among theatre lovers.

The profit of this annual gathering is placed to the credit of the relief fund for the benefit of those who are not eligible to membership in the society for reasons over which they have no control.

It is stated that a good sum has been realized from this year's entertainment.

The officers of the society are: Charles J. Lemaire, president; J. J. Keefe, vice-president; T. M. Brennan, treasurer; C. A. Kilfoyle, financial secretary; Mary E. Saunders, recording secretary. Executive Committee: W. J. Quinn, W. W. Price, J. V. Riddick, R. J. Marrin, O. H. Brown, A. F. Kavanaugh, F. X. O'Connor, F. J. Sheridan, E. J. Oakley, Walter Redlefsen, J. N. Kelley, and G. J. Condon. Trustees, T. M. Brennan, Gardner Irving and H. E. Burrill.

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Success of Wireless Telephony

The broadcasting by wireless telephone of President Harding's address over the body of America's "unknown soldier" on Armistice Day at the National Cemetery at Arlington, Va., was a great triumph for the new art.

To accomplish this wonderful feat the Bell Telephone Company employed nearly ten thousand miles of circuit and double that length of wire.

Colonel J. J. Carty, vice-president of the American Telephone and Telegraph Company, and head of the department of development and research, which developed the apparatus and brought it to its high state of perfection, was recently asked what he considered the most important feature of the loud speaker development. He said:

"The change that it is bound to create in the art of oratory. Heretofore orators have been chosen largely for their loud voices, their capacity to reach the ears of those at the back of the hall. We will make it possible for any ordinary man with common sense, possessing the average speaking voice, to get his thoughts into the minds of as many auditors as he may want to reach. Effective addresses by our plan can be made by men speaking no louder than a teacher speaks to his students in the classroom."

Thus the functioning of the "loud talking" system on Armistice Day marked an epoch in communication.

So in San Francisco, on Armistice Day, the civic auditorium and civic center were opened to the public and these places, where the audible features of the ceremonies at Arlington were transmitted, were the magnet for the city's massed observers.

In New York City, nearly 1,000 veterans, gold star mothers, a large delegation of wounded and crippled soldiers, representative of 300 American Legion posts, veterans of the Grand Army of the Republic and other organizations and the general public took the 15,000 seats in Madison Square Garden long before the opening of the service. A great crowd gathered in front of the Garden and in Madison Square, where the powerful electric megaphones also trumpeted the President's address.

Voices and music arriving over the telephone were flung out from an amplifier about the size of an ordinary desk concealed behind flags on the speaker's platform. The sounds penetrated with uniform distinctness to the parts of the auditorium remote from the speakers' platform.

In the open air the President's voice, delivering his message, swept over the crowd in Madison Square as if coming from the chest of a giant, the sounds being heard more clearly than the voices of Colonel Theodore Roosevelt and Martin Littleton as they spoke from the platform in the Garden. Words strongly accented crossed the Square to Broadway in one direction, and to Twenty-third Street in the other. Music of the ceremonies at Arlington—the crisp notes of the bugle, the playing of the band and the singing of the quartet—was carried to the Flatiron Building, three blocks distant.

In addition to the President's address, the brief words of Admiral Beatty, Marshal Foch, General Diaz and other foreign soldiers, as they laid medals on the casket of the unknown soldier, came to the listening thousands.

The broadcasting stations of the Westinghouse Electric and Manufacturing Company for wireless telephony are located at Pittsburgh, Chicago, Newark, and Springfield, Mass., and the Western Electric Company have a broadcasting station at their research laboratory, 463 West Street, New York. All day long and every evening these broadcasting stations are supplying the surrounding community with music and song and the news of the day. It is a valuable service and is free to all who have the necessary wireless telephone equipment. It is estimated that there are now several hundred thousand persons listening in to the broadcasted concerts.

Although the National Government has enacted laws to control the activities of the amateur, American radio novices enjoy much more leeway than tyros in other countries. Here a licensed operator is permitted to work over a radius of 200 meter wave lengths, while in England, Australia and Canada he is limited to fifty meter wave lengths. France permits amateurs to receive only, confining them to time signals and weather reports. Holland lets amateurs receive, but prohibits sending. Germany will not allow amateurs to handle radio messages in any form.

A person may receive without a license, but he can't send without one.

Old Time Telegraphers' and Historical Ass'n

President B. E. Sunny, Chicago, has appointed the following committees in connection with the annual reunion of the Old Time Telegraphers' and Historical Association, to be held in Chicago next year, probably the last week in August:

Ladies: Mrs. W. E. Bell, chairman; Miss Bell, Mrs. A. C. Cronkhite and Mrs. A. W. Towsley.

Finance: F. J. Loesch, chairman; A. C. Cronkhite, R. C. Baker, W. E. Bell, E. W. Collins, A. J. Earling and Chas. H. Shedd.

Membership: Chas. H. Shedd, chairman; Herbert Brown, E. W. Collins, A. C. Cronkhite and A. W. Towsley.

Publicity: W. E. Bell, chairman; A. C. Cronkhite and R. C. Baker.

Hotel: F. W. Cushing, chairman; H. Brown and C. M. Baker.

Entertainment: B. E. Sunny, chairman; A. W. Towsley, H. Brown, R. C. Baker and W. E. Bell.

Badge: A. W. Towsley, chairman; R. C. Baker, M. W. Rust and T. N. Powers.

Herbert Brown, Western Union Telegraph Company, was appointed local secretary and treasurer.

The chairman of each committee has been instructed to add to their number as occasion demands. Thomas E. Fleming, 195 Broadway, New York, is secretary of the Association.

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STUDENT'S COURSE IN TECHNICAL TELEGRAPHY

By Louis Casper

Lesson 41

Distribution of Potentials on Imperfectly Insulated Circuits

In the preceding Lesson the effect of potentials impressed upon a perfectly insulated line was discussed. It is obvious, however, that no telegraphic circuit is ever perfectly insulated, and during rainy or foggy weather the insulation is usually so imperfect that the normal distribution of potentials is materially modified.

In Fig. 114 is represented a line L between A and C, with a generator G at station A, which produces an e.m.f. equivalent to the vertical line from A to B. At *d* there is an escape which may be through a conductor of known resistance. The fall of potential between B and *d* and *d* and C may be determined if the resistance of the line L between

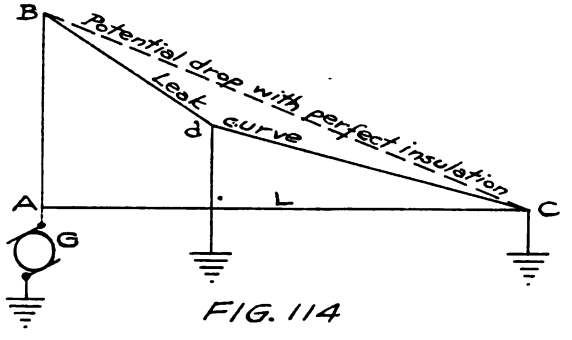

FIG. 114

A and *d* and *d* and B is known, inasmuch as it will be in proportion to its resistance based on Ohm's law, that in the whole or any portion of a circuit, the fall of potential is always proportional to the resistance. It will be noted that the fall of potential is greater from A to *d* than from *d* to C.

In Fig. 115 there are shown two points of escape of an assumed equal resistance at *d* and *e*. Similarly Fig. 116 shows the distribution of escape from a number of points on the line L. In each of these cases the line at C is in direct connection with the earth and the potential at that point is zero. The difference of potential between each two successive points of escape becomes less and less as the distant extremity of the line is approached, and hence it follows that the quantity or effective strength of current in the line progressively decreases at each point, but that the decrease becomes less and less rapid as the terminal station C is approached. In a telegraph line the number of points of escape are very numerous, being necessarily equal in number to the points of support, and hence the line of potential BC becomes a descending series of variable curves. The less the resistance of the leaks, or, the greater the leakage at each point, the more will the curve BC of potentials vary from the normal straight line.

Resistance and Current in Leaky Lines

The effect of imperfect insulation upon a line, whether general or localized in spots, is to largely reduce its resistance and to proportionately increase the quantity of "sent out" current as observed on a milameter at A in Fig. 117. When the circuit is perfectly insulated the current sent out and that received is, in this case, 9 milli-amperes. With the changes in resistance of the leak as shown, the conditions are as tabulated:*

Resistance of Fault	Current Sent Out	Current Received
(a) 4000	9 milliamperes	9 milliamperes
(b) 2000	10 milliamperes	8 milliamperes
(c) 1000	10.8 milliamperes	7.2 milliamperes
0 full earth	18 milliamperes	0

It will be seen that when the resultant leak is at the center of the circuit the current sent out is increased by precisely the same amount as the received current is reduced.

The effect of a fault of given resistance upon the working of a circuit is influenced very considerably by its position on the line. The ill effects of leakage to earth are greatest when nearest to the center of the circuit and least when in the proximity of either end. As a matter of fact, a leak which at the center of the circuit would render working impossible may, if situated at or near either ter-

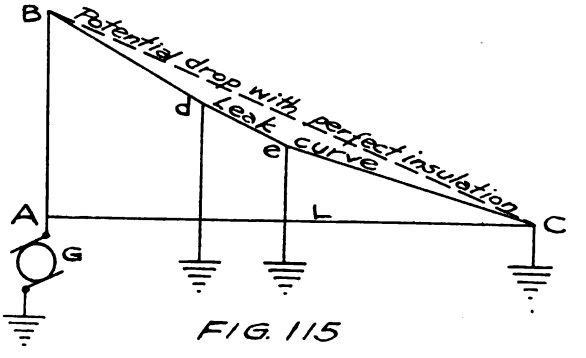

FIG. 115

minal of the line produce comparatively small interference.

"Weather-Cross" or "Cross-Fire" on Circuits

The escape of the current through the insulators, poles and cross-arms from one wire to another in wet weather produces what is known as "weather-crosses" or "cross-fire" and is a far more prolific cause of interference in the working of telegraph lines than mere leakage to ground. This effect is often miscalled "induction," but there is a decided point of difference between that and "cross-fire," inasmuch as "weather-cross" opens up a more or less direct path or connection between line and line, whereas inductive interference in wires is manifested regardless of weather conditions.

As electric currents always flow in greatest quantity in the direction of the least resistance, the tendency is for currents to escape from a long circuit to a short one, or from a wire of higher into one of lower resistance. A simple escape to ground due to

*Herbert—*Telegraphy.*

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weather conditions, if not too serious, may be overcome by a judicious increase of battery potential; but when traverse leakage or "cross-fire" exists between different wires paralleling each other on the same pole line, any attempt to increase the potential in order to improve the working of one wire, produces a detrimental effect upon the working of all others parallel to it.

Upon the occurrence of a sudden shower, the effects of cross-fire are usually manifested sooner than those of "escapes" to ground, because the horizontal cross-arms are wet and become partial conductors sooner than is the case with the vertical pole.

Electrostatic Capacity of Lines

In Lesson 28 the phenomenon of electrostatic capacity was exemplified. In this connection it was stated that every electric circuit possesses some capacity and that every circuit is capable of receiving and holding a charge of electricity. In further explanation of capacity insofar as it relates to the operation of duplex and quadruplex circuits, it would be desirable to discuss still further the theory of electrostatic accumulation upon insulated conductors.

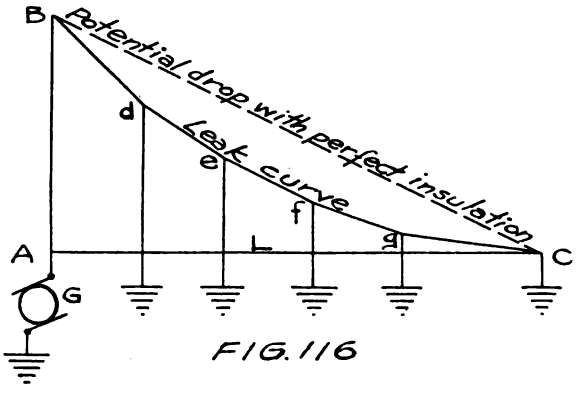

FIG. 116

When a quantity of electricity flows through a long insulated wire, a certain definite portion of the current is progressively accumulated as a "charge" upon the surface of the conductor. The quantity thus accumulated, or stored up, depends upon (1) the superficial area of the conductor, (2) its distance from the earth, and (3) upon the character of the insulating medium which intervenes between the line and ground. The portion of the current thus tied up in the form of a "static charge" is, of course, not available for the direct production of signals.

A cable acts like a condenser in that it takes a "charge" proportional to the difference of pressure developed between its inner conductor and the outer sheathing which is connected to the ground. As the potential or pressure falls in a conductor in direct proportion as resistance is overcome, it follows that the static charge of a wire is not under all conditidons the same at each point of its length.

In order to make this more clear, we will refer again to Fig. 112, illustrated in Lesson 40, and which is herewith reproduced.

In diagram *d* of this figure, the positive pole is impressed on the line, which is grounded at *o*, and the slope of potential drop is represented by the diagonal line showing such fall from 160 volts to zero; hence, at the first ordinate or vertical line representing a distance of 75 miles from the terminal *o* the potential drop would be 120 volts, and at 50 miles 80 volts, and so forth.

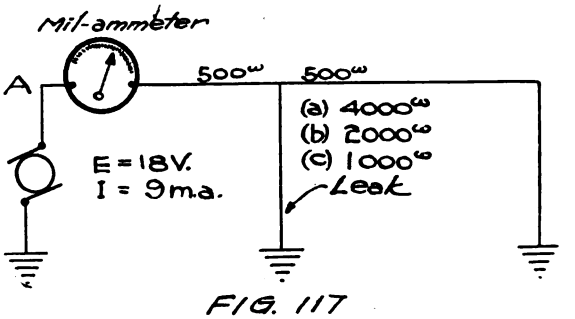

FIG. 117

Since, then, the conductor in diagram *a* when taking a charge acts like a condenser, it follows that under such conditions with respect to e.m.f. and wire and assuming each portion of the conductor capable of holding an equal quantity of accumulated electricity, the charge immediately at the generator would be the maximum. At that portion of the line where the potential has dropped to 120 volts the capacity would be ¾ less than maximum. At the drop to 80 volts the charge would be ½ less than maximum. At 40 volts drop, the charge would be ¼ the maximum, and so on, and the total charge of the conductor would be equal to the sum of the various charges at each portion of the conductor.

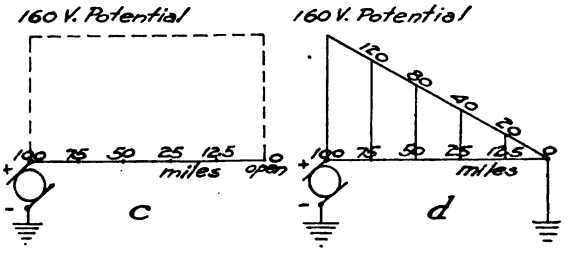

FIG. 112

If the line is open, as in the case of diagram *c*, the potential is represented by the dotted parallelogram, in which case the capacity charge would be similar in all parts of the conductor represented in this diagram.

It will be seen that these figures are identical with those which have heretofore been employed in illustrating potential. The area inclosed by the base line and the line of potential may be taken to correctly represent the electrostatic charge in each case. A consideration of diagram *d*, Figure 112,

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will show that when the line is to ground at the distant end, as in duplex or quadruplex operation, 75 per cent. of the aggregate charge of the wire is accumulated upon the first half of it, and only 25 per cent. upon the second half. Therefore, the currents of charge and discharge are three times as great at the battery end as at the ground end. This is upon the assumption that there is no appreciable loss through imperfect insulation and that the line is made up of one kind and gauge of conductor. It is obvious, however, that with mixed or patched conductors this would be somewhat modified, as would be also true of the fall of potential in a circuit of this character.

(*To be continued*)

———o———

Southern Telegraph Reminiscence

By "N."

Names mentioned in a recent article in your magazine recall pleasant memories of early days and times, as also the actors on the telegraphic stage of that period.

Tom Boyle, Bill Benton, two names to handle gently and with loving care, for they were characters, prominent in that day, and their memory lingers with us pleasantly to this day.

Am quite sure Bill has passed on, but Tom may possibly be with us, though I have lost track of him these many years. (T. A. Boyle is an active member of the telegraph profession in Florida.)

In the early 70's, the word was passed down the line from "W" to "A" of an event in the Capitol city that was of interest to the boys in "A" office. A little later in the day, an old palmetto fan was found on one of the "local tables," and inscribed thereon was the following:

"Adam and Eve were very vain,
When they brought forth their little Cain;
But Dennis Brown beat them by far,
When he was made a happy Pa-Pa.
The news it spread from Washington
That Dennis had a little son,
And all the men in that big town
Congratulated Mister Brown.
Dennis, don't get mad at these 'ere rhymes,
Of course, you understand the times;
This day you have proved yourself to be
A better man than T. A. B."

Two of the lines have escaped me; T. A. B. were the initials of Tom Boyle; Dennis, you all know, is still with us and going strong, but it is my recollection the little "son" proved to be a little "daughter," and the missing lines apologized for the mistake.

In this same "A" office (Augusta, Ga.), Pat Dunne was the office goat, always in a good humor, and in hooking up the messages to be sent and carrying to the front office those to be copied and delivered, he generally kept step to some popular song he was humming. Unfortunately, Pat only knew a few words of his favorite, consequently he repeated over and over the words he knew, viz:

"All I want in this creation,
Is a pretty little wife and a big plantation."

The sameness got on Bill's nerves, and the following dialogue ensued:

Bill—Pat, won't you please sing the rest of that song for me?

Pat—Am sorry, Mr. Benton, but that is all I know of it.

Bill—Well, pickle those two lines for the present and I will write the remainder of it for you.

As a man of his word, Bill soon sneaked off to a local corner of one of the walnut "quartettes," and undertook to finish the song, starting off with what Pat had already memorized.

"All I want in this creation,
Is a pretty little wife and a big plantation."

After writing these two lines, he leaned back for a little brain work and Chief John Brown caught sight of him.

Chief—Who are you working with over there, Bill?

Bill—No one just now.

Chief—Well, come here and I will introduce you to a busier wire.

Bill slipped his "effort" under the blotter and responded to the chief's call.

Tom Boyle had been watching the proceedings and immediately walked over to take a look at what Bill had been doing. On reading the two written lines he at once finished it with:

"What you want you'll never get,
H—l will be your portion yet."

Pat refused the song as written.

In the December 1st issue of TELEGRAPH AND TELEPHONE AGE, I note the mention of two other old-timers, both of whom I knew well: Orvie Parker of Austin, Texas, formerly of Tebeauville, Ga., and William Fleming of Charleston, S. C. I might add, am in a position to *tell* on both of them, provided I find there are a sufficient number of old-timers left to care to read of incidents long since passed and gone. I sincerely trust that Mr. Fleming's health will be restored and that his good wife, Dora B., is still with him. He was born and raised in Charleston, but had to leave the city to court her by letter, he hadn't the nerve to stay in town and say it. He returned to Charleston when she said "Yes."

———o———

Telephone Development in Chicago

Within the corporate limits of the city of Chicago there are now 600,000 telephones. This announcement was recently made by the Illinois Bell Telephone Company, which completed the job of installing telephone No. 600,000 in a North Side business office.

The following list shows the growth of the telephone system in Chicago: 1905, 100,000; 1909, 200,000; 1912, 300,000; 1915, 400,000; 1918, 500,000; 1921, 600,000. There are more than 1,000,000 telephones in the whole Illinois Bell System.

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EDITORIAL COMMENT

New Year Resolutions

Among the resolutions to be made by the readers of this publication beginning with the new year, 1922, should be declarations to first not only to live within one's income, but to save a portion of that income. This is the first and most important duty of every individual. This much is certainly due to both his family, if he has one, and himself, if unmarried, for no one can foresee what the future has in store. An account in a savings institution lightens misfortune in times of adversity and renders life more bearable and enjoyable.

Education should come next. No one, male or female, is too old to acquire useful and valuable knowledge, or new ideas, either to the advantage of the profession or to himself or herself individually. A few minutes time each day devoted to study means at the end of a year that the scientific problems of our industries are better understood, and the services of such persons to the companies have necessarily enhanced in value. The electrical industry is but a temporary vocation to many. It affords them an opportunity to pursue educational studies, which eventually lead and guide them to their proper sphere of usefulness in this world.

The Electrical Review, the well-known weekly electrical journal, established in 1882, and printed in New York until a few years ago, when it was transferred to Chicago, has been sold to the McGraw-Hill Company, Inc., of New York, who will take over the property as of January 1st, 1922. The name will be changed to the *Electrical Review and Industrial Engineer,* and will continue to be published in Chicago, and it will appear monthly instead of weekly, as heretofore. Charles W. Price, who has been identified with the *Electrical Review* for almost forty years, retires from the management of that publication.

Flashlight Telegraph Service

The telegraph and cable companies recently bulletined for the benefit of their customers the following: "The flashlight telegraph service to the Island of Montserrat is restored."

Our readers will no doubt be interested in this announcement. The flashlight telegraph service between the islands of Antigua and Montserrat, a distance of approximately 23 miles, was interrupted for a few days, no doubt by climatic conditions.

Montserrat is one of the Leeward Islands in the West Indies group. It is about 11 miles in length and 7 in breadth, comprising an area of 32½ square miles. The population in 1911 was 12,196. The island was discovered by Columbus in 1493. It is mostly considered the most healthy and beautiful of the Antilles. It contains several hot springs. About two-thirds of the island are mountainous, the rest well cultivated. The chief town is Plymouth, with a population (1911) of 1,534.

The island is owned by England, and several attempts have been made to connect it with the mainland by submarine cable, but the amount of telegraph service would not warrant the necessary expenditure of money for this purpose. It is expected, however, that before long the island will be linked by radio service.

THE aerial cable erected between New York and Pittsburgh by the American Telephone and Telegraph Company, as described in our issue of October 16th on page 474, weighs over four thousand tons. There are in all nearly two thousand sections spliced end to end. The pole line consists of upwards of thirteen thousand twenty-five-foot chestnut poles.

Telegraph and Telephone Life Insurance Ass'n

Assessments Nos. 712 and 713 have been levied by the Telegraph and Telephone Life Insurance Association, New York, to meet the claims arising from the deaths of James Campbell, Brooklyn, N. Y.; Emory H. Falls, Westfield, N. J.; William Eccles, Burlington, Kansas; Edward McGonigal, Philadelphia, Pa.; Walter B. Keister, Richmond, Va., and Homer E. Bishop, Sioux City, Iowa.

Rules of Business

1. Handle the hardest job first each day. Easy ones are pleasures.
2. Do not be afraid of criticism—criticize yourself often.
3. Be glad and rejoice in the other fellow's success—study his methods.
4. Do not be misled by dislikes. Acid ruins the finest fabrics.
5. Be enthusiastic—it is contagious.
6. Do not have the notion that success means simply money-making.
7. Be fair and do at least one good act every day in the year.
8. Honor the chief. There must be a head to everything.
9. Have confidence in yourself, and make yourself fit.
10. Harmonize your work. Let sunshine radiate and penetrate.

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TELEGRAPH AND TELEPHONE

The importance of the telephone and the telegraph is typified in the care that is being taken to manufacture reliable and efficient apparatus. But no matter how well the apparatus is constructed, it is of little value unless the battery supplying the energy is of similar reliability and efficiency, with resultant clear transmission and non-interruption of service.

LOW COST FIGURES

As the cost of inspection and maintenance is made up chiefly of inspectors' or linemen's expenses enroute, the use of a single battery of high capacity, capable of taking care of all functions at a station for a period of two years or more without attention or renewal, brings maintenance figures way down.

CONSTANCY OF VOLTAGE

For telephone and telegraph work four Edison cells having a rated capacity of 200 ampere hours (type 202) or 250 ampere hours each (type 252) are recommended. Both will give full rated capacity, even though in service for years. There is no deterioration on open circuit. In service of this kind, the voltage remains practically constant throughout the entire life of the cells.

EASE OF INSPECTION

Little attention need be paid to Edison cells once they are set up. A patented feature—panels in the lower portions of the zinc—tells the condition of the elements. The first perforations appearing in the panels warn that the elements are approaching exhaustion. Supplied with heat-resisting glass jars, the elements in Edison cells are easy to inspect at all times, even though it is unnecessary to inspect them until they approach exhaustion.

THOMAS A. EDISON, INCORPORATED,
Primary Battery Division, Bloomfield, N. J.

750 People's Gas Bldg., Chicago, Ill.
1205 Hobart Bldg., San Francisco, Cal.
2044 Railway Exchange Bldg., St. Louis, Missouri.

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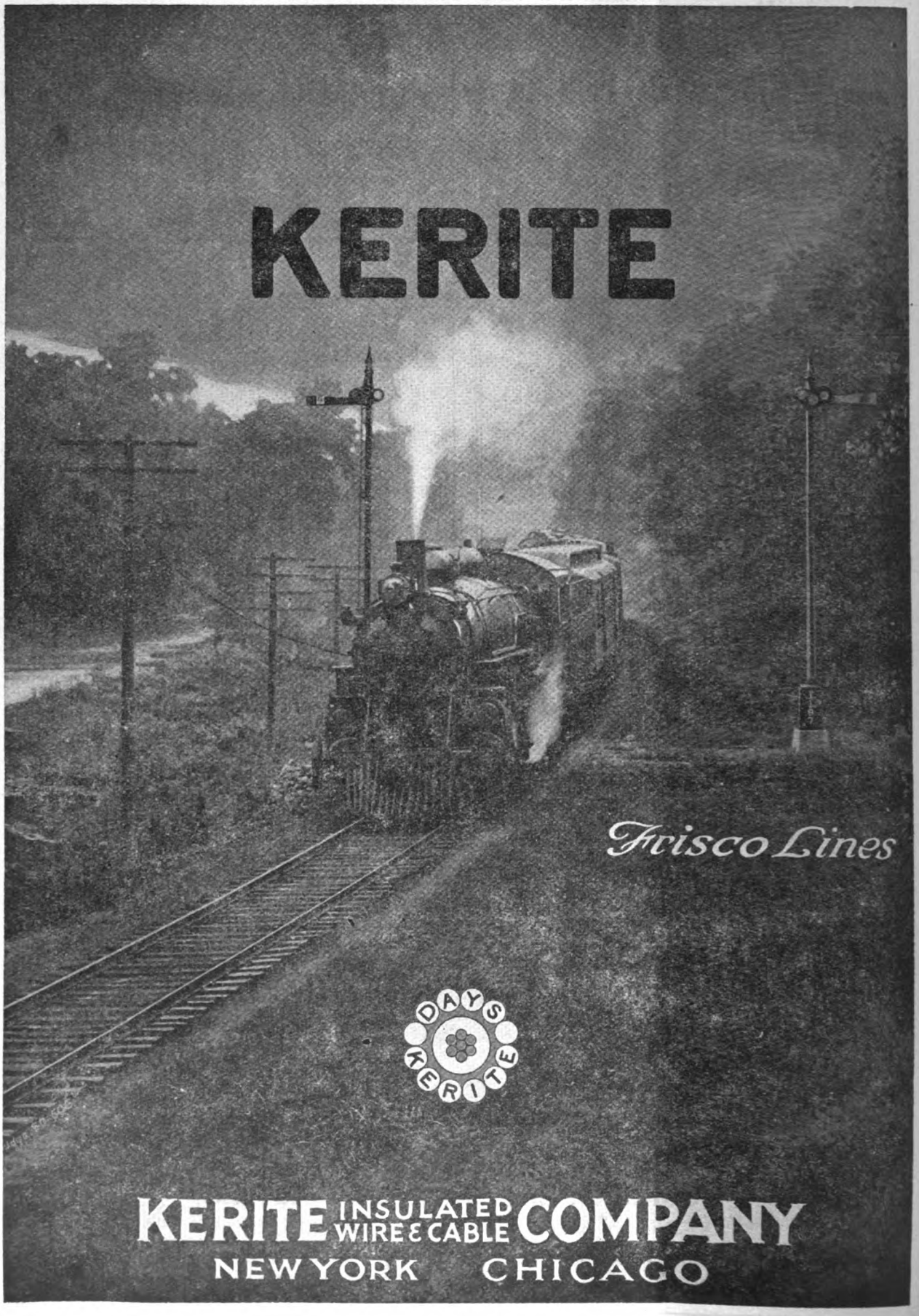

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THE RAILROAD

Telegraph and Telephone Section of the American Railway Association

Committee B, Wire Crossings, at its recent meeting in New York considered the revising of the specifications reported at the fall session at Cleveland, Ohio. based upon activities in this connection in the State of Ohio, where a committee has been formed to get up similar specifications. It appears that the railroads cannot properly follow the Bureau of Standards safety code railroad rules regarding the so-called signal wires and the railroad representatives propose to make such changes in the Bureau rules as will make them suitable for wire crossings for railroads.

BUREAU OF STANDARDS

The term "signal wires" should be changed to "communication wires."

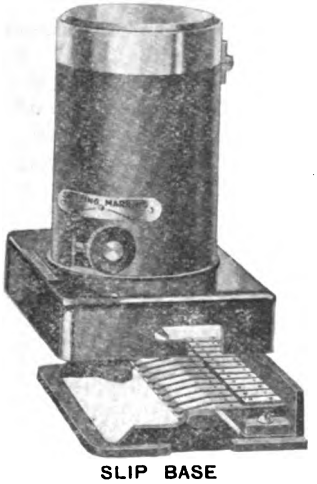
At the recent meeting of Sub-Committee A, Wire Crossings, attention was called to the fact that the Bureau of Standards safety code rules in its designation as to what are "signal wires" is adopting a term that will cause confliction and possibly damage on account of the railroads generally having two kinds of signal wires. One, the low voltage direct current wires similar to telegraph and telephone, and the other the high voltage alternating current signal wires. In order to avoid the confusion and trouble that may occur by use of the term "signal wires," the Telegraph and Telephone Section, Committee B, proposes to refer to the low voltage wire as "telegraph and telephone and other communication wires," the name "communication wires" to take the place of the Bureau of Standards designation "signal wires." The voltage and current allowable on such communication wires will be exactly the same as prescribed by the Bureau of Standards for the so-called signal wires. Efforts will be made to have the Bureau of Standards change its designation from "signal" to "communication wires" in order to avoid conflict with the long standing existing practice of railroads.

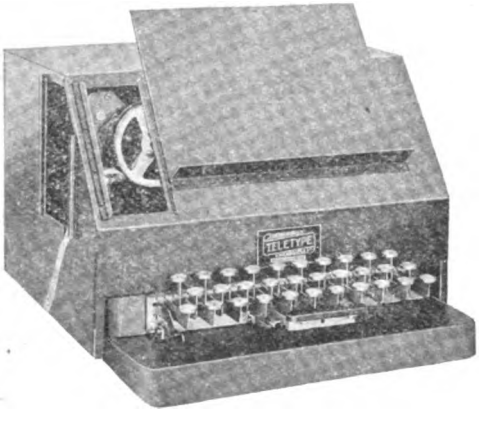
Committee No. 6, Message Traffic, held a meeting in Chicago on December 9th, to formulate its report for the March session, which will take place at Richmond, Va.

Sub-Committee G—Apparatus, Material and Tools, Sub-Committee H—Location and Layout, Sub-Committee J—Circuits and Current Supply, and Sub-Committee K—Installation and Maintenance; Committee No. 2—Construction and Maintenance—Inside Plant, held meetings in New York during the week beginning December 12th.

Committee No. 2—Construction and Maintenance —Inside Plant, will hold a meeting in New York on December 17th.

Committee No. 4—Protection Against Lightning or Electric Light and Power Circuits, held meetings in New York on December 13th and 14th.


SLIP BASE WHEATSTONE RELAY


TELETYPE

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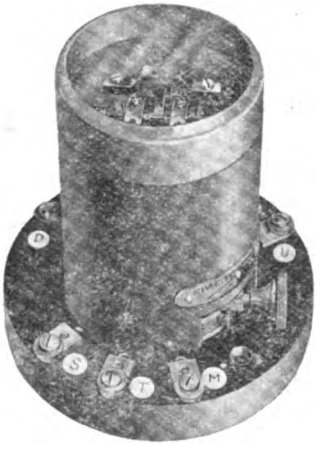
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The manual of recommended practices of the Telegraph and Telephone Section of the American Railway Association is in course of distribution. The secretary, W. A. Fairbanks, is now forwarding the inserts, which consists of 320 pages, to the membership at large.

J. C. Browne Becomes Superintendent of Telegraph of the Missouri Pacific System

Effective December 1st, J. C. Browne has been appointed joint superintendent telegraph of the Missouri Pacific Railroad Company and the Western Union Telegraph Company, with headquarters at the Railway Exchange Building, St. Louis, Mo., vice E. A. Chenery, deceased.

Mr. Browne was born on a plantation in Virginia in 1866. In 1882 he entered the service of the St. Louis, Iron Mountain & Southern Railway, now Missouri Pacific, as an operator in Little Rock relay office. He worked continuously in that office until 1887, when he was appointed chief operator and manager. In 1892, in connection with the same, he worked in construction gangs, performing actual labor of telegraph construction and reconstruction work. In July, 1895, he was appointed general foreman of telegraph construction and repairs in connection with his managership of the Little Rock relay office. In this dual position he served until August, 1907, when he was relieved of the managership of the Little Rock office, and given exclusive charge of telegraph and telephone construction and repairs on the Missouri Pacific Railroad System with headquarters in St. Louis, with title of supervisor telegraph, and in December, 1918, was appointed assistant superintendent telegraph.

Mr. Browne had charge of all matters pertaining to construction, and maintenance of the telegraph and telephone plant of the Missouri Pacific System, which position he held until his present promotion.

The Louisville and Nashville Railroad Right of Way

Editor, TELEGRAPH AND TELEPHONE AGE.
Dear Sir:

My attention has been called to the publication in the TELEGRAPH AND TELEPHONE AGE for December of an item under the title "Louisville & Nashville Railroad Right of Way," to the effect that Commissioner Menzies, in the suit of the Louisville & Nashville Railroad Company versus the Western Union Telegraph Company, pending in the United States district court in Kentucky, "finds in favor of the railroad" and "awards that company a verdict" of $2,300,000 for the use of its right of way by the Western Union Telegraph Company for a period of about nine years.

This is not quite a correct statement of the facts. Commissioner Menzies had no authority to "award" a "verdict," and has not, in fact, found for the railroad company in any particular amount. The precise amount which the railroad company is entitled to recover from the telegraph company depends on a number of disputed questions of law, which were not and could not have been considered by Commissioner Menzies, but have still to be passed on by Judge Cochran. Mr. Menzies was acting in this matter as a special master, for the purpose of taking testimony and reporting to the court (Judge Cochran) his conclusions as to certain matters of fact. One of those matters of fact was the question of the reasonable value per mile per year of the use of the railroad company's right of way for telegraph purposes in those jurisdictions in which a nominal measure of damages has not been fixed by law, and at those places where the telegraph company had no legal right to maintain its line on the railroad company's right of way without the consent of the latter company. It is true that on this question the special master reached the conclusion that, as between these particular companies, having in view their past relations under the contract, a reasonable award would be at the rate of $73 per mile per annum, as against the telegraph company's contention that a nominal amount, or not to exceed from $5 to $8, would be reasonable, and as against the railway's contention that a reasonable rental was from $100 to $200 per mile per year. Even on this question of fact his finding is subject to review by Judge Cochran, and the number of miles of right of way to which the unit rate finally determined on by Judge Cochran shall be applied will also depend on the decision of the various questions of law to which I have already referred.

It would, of course, be useless as well as improper to offer any prediction as to what Judge Cochran's action will be; but the important matter is that it is far from accurate to state that any such verdict or award as $2,300,000 has been made against the telegraph company; and I am betraying no secret when I say that the telegraph company's counsel entertain very strong hopes that the final award will not bear even a family likeness to these figures.

The publication of the statement as made in your December 1st issue, page 543, may have a tendency to confuse other companies interested in this question; and I shall greatly appreciate it if you will print this letter in your next issue. I am,

Yours very truly,
FRANCIS A. STARK.
General Attorney.

B. J. SCHWENDT, superintendent of telegraph of the Kanawha & Michigan Railway, Columbus, Ohio, has constructed two lines betwen Gauley Bridge and Swiss, W. Va., a distance of one hundred and sixty miles. One of these lines is equipped with train dispatching telephone apparatus and the other wire is for Morse message operation. There are sixty way stations.

G. A. KIRLEY, superintendent of telegraph, and A. R. Belmont, telegraph and telephone engineer of the Boston and Albany Railroad, Boston, Mass., were recent New York visitors in connection with the reconstruction of a stronger pole line between Boston and Worcester, Mass.

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All America Cables Staff Dinner

The annual dinner of All America Cables, Incorporated, took place at the Hotel Astor, December 10th, when over 300 employees participated in a thoroughly enjoyable and typically American entertainment.

John L. Merrill, president of the company, acted as toastmaster, and after toasting the President of the United States, offered a toast to the presidents of all the Republics of the Americas, which was heartily responded to. Then followed a touching tribute to the founder of the company, the late James A. Scrymser.

A particularly interesting ceremony was the tribute to the flag. Miss Gertrude Merritt, late yeomanette in the Navy, escorted by ex-service men in uniform, carried the Stars and Stripes into the banquet hall. A recital of the American's Creed was impressively delivered by J. F. Beckett, a member of the cable staff, and immediately after this all arose and remained standing while the pledge to the flag was given, followed by the National Anthem.

Another feature of the evening will be long remembered as a particularly memorable one; namely, the first public appearance in America of Cesare Ronconi, the youngest opera tenor in the world. Ronconi has just returned from Italy, where he traveled in the care of the late Enrico Caruso and studied under the celebrated master, Prof. Mandolini six years. Mr. Ronconi made his debut at the Theatre Lyrico, Milano, Italy, at the age of eighteen. Mr. Ronconi's accompanist was Mr. Bilotti, also an American, and a pupil of the great Busoni. "Dreams," by Bartlett, and "Carmela" by Tosti, were done remarkably well by the young tenor. He sings with great ease and has a rare quality in his voice which will undoubtedly earn for him a place among the foremost singers in America.

Mr. Ronconi's career is being watched with great interest by the members of the All America Cables, not only because of his ability, but also because in his early days he was a messenger boy for the company.

Mr. Merrill, who is chairman of the United States Committee for the Brazilian Centennial Memorial, said in part as follows: "All South America is bound to us by geographical, historical and commercial lines. The hundredth anniversary of Brazil's independence furnishes an opportunity to pay a graceful compliment and show our spirit of generous appreciation of the real friendship that exists between our countries. Accordingly, the citizens of the United States have spontaneously offered to present a beautiful monument, emblematic of our affection for her."

Mr. Merrill continued: "The watchword of our future prosperity must be unquestionable honesty and real friendship in all our relations with our great sister republics. You who are so closely associated with them through this splendid cable system that has been created, will participate in the harvest that is rapidly ripening for all those who strive to live up to the principles of Washington and Lincoln, Jose Bonifacio and Rio Branco.

"Since we last met we have expanded to Santiago, Cuba, and Porto Rico; our entire equipment has been brought to the highest degree of efficiency; the new cable ship *All America,* has been added to our fleet, so that now, more truly than ever, we are in a position to link more closely the bonds of friendship which are so necessary if we are to attain the business relations which we are trying so earnestly to cultivate."

THIS company has contracted with the Costa Rican Government to lay a cable from Port Limon, Costa Rica, to the Isthmus of Panama, where it will make connection with the All America Cable System. The cable has to be made, but it is expected that the work will be completed within eighteen months.

—o—

Radio Corporation of America

S. INADA, of Tokyo, chief radio engineer of the Japanese Department of Communications, who is in attendance at the Disarmament Conference in Washington, was a recent New York visitor.

CAPTAIN Powhatan Page, of the Pan-American Wireless Telegraph and Telephone Company, Buenos Aires, Arg., who has been in New York for several weeks, sailed for home on the steamer *Aeolus,* December 7th.

WILLIAM BROWN, attorney, has returned from a business trip to Washington.

S. D. COFFMAN has been appointed custodian at Belmar Station, N. J., vice R. D. Greenman, deceased.

H. E. FEATHERS has been appointed assistant engineer-in-charge at New York Radio Central, vice R. E. Franklin, transferred to Kahuku, T. H.

A NEW branch office has been opened at 105 Hudson Street, New York.

THE annual report of the Radio Provident Association shows that it is in a healthy condition, during the past year having made a profit of 16 per cent. for its 75 members.

THE annual Christmas party for employees will be held at the head office Friday evening before Christmas.

J. B. ROSTRON, assistant traffic manager, has returned from his vacation. During his absence his duties were performed by H. Chadwick, superintendent.

G. A. BELLIS, of the accounting deparment, New York, was married at Baltimore, November 22nd, to Miss Marian Lynch.

EMIL OSTERBIND, supervisor of the well-known German station at Nauen, is visiting the Radio Corporation of America for several weeks to gain impressions of American radio methods with a view to seeing if they are applicable to the German system.

B. F. HOARD sailed for Germany December 2nd

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on the steamer *Wuerttemberg*, for the purpose of inspecting radio operating methods in that country.

E. J. Nally Elected Vice-President Marconi Sports Club of London

One of the interesting features in connection with the various Marconi Companies in London is the great interest taken by all employees in the Marconi Sports Club—an organization encouraged and assisted by the executives of the various companies.

The Marconi Sports Club boasts a fine field in the suburbs of London, with club houses, tennis courts, and all necessary equipment, in charge of a physical instructor. Cricket matches and other tournaments are played on this field almost every evening during the summer months and regularly every Saturday afternoon.

The annual finals attract much public attention and a very large gathering of spectators, and suitable silver cups and prizes are awarded the champions.

E. J. Nally, president of the Radio Corporation of America, New York, was recently elected honorary vice-president of the Marconi Sports Club, and in the name of the Radio Corporation presented the club a handsome silver trophy which will be of a permanent character. The Radio Corporation cup will be competed for annually and will be held by the winner for the following twelve months.

It is suggested that some such scheme of athletics might be inaugurated by the staffs of the Radio Corporation of America, New York, by combining the Broad Street office, executive office and 326 Broadway office forces.

Westinghouse to Cover United States by Wireless

The Westinghouse Electric & Manufacturing Company has announced a plan of covering the entire United States with a radio broadcasting service to the home that will allow anyone, anywhere in the country to enjoy the benefits of radio.

The operation of the first radio broadcasting station of its kind in the country at East Pittsburgh for the past twelve months, has opened possibilities hitherto undreamed of. From this station alone persons in Canada, New England, Florida, Arizona, the Dakotas, and at greater distances, have been able to enjoy the service. Even in Cuba, Mexico and on ships in the Middle Atlantic and in the Gulf of Mexico persons have heard the concerts broadcasted from East Pittsburgh. In order to cover certain parts of the country not reached by this station, the Westinghouse Company has already added two additional stations. At Springfield, Mass., station WBZ supplies New England; at Newark, N. J., station WJZ takes care of the Middle Atlantic and southern States; and at Chicago, Ill., station KYW serves the Middle and Western States.

The fact that the pioneering work of Westinghouse has not been in vain is shown by the fact that although operating a full year, station KDKA at East Pittsburgh continues to interest more people as time progresses. This is due, however, not so much to the novelty of radio telephone broadcasting ing, but to the well-planned and diversified program that has been established. The service started with the transmission of presidential election returns in November, 1920, and has progressed through the broadcasting of phonograph music, entire church services, speeches of prominent men, acts from theatres, musical recitals, reports of boxing contests, results of baseball, football and basketball games, complete minstrel shows, Government market reports, New York stock market reviews, national and international news from the station at East Pittsburgh. At Springfield, Mass., in addition to many of these features, there is a periodical talk to farmers about market and stock conditions. A feature of the Newark, N. J., broadcasting station has been bedtime stories for the children, marine information, and talks on radio. The complete transmission of grand opera from the Chicago Opera Company production has been the feature of the recently established station on the Commonwealth-Edison building in Chicago. It is predicted that as a result of the diversified entertainment and information which has been broadcasted through these stations during the past year will be a distinctive service to mankind. In all probability the radio will be as popular in the home as the phonograph is today, and will be of as great interest to the public as the moving picture show.

At the present time the number of radio amateurs in this new science in this country is estimated in the hundreds of thousands. It is really an error of statement to characterize this whole multitude as "amateurs." It is also a mistaken idea that a majority of radio enthusiasts are small boys or youths in their teens. Men in all walks of life derive much beneficial entertainment from this instructive mode of recreation. This does not, however, mean that the younger generation are not interested, because such is far from the case. Wireless has more than an ordinary appeal to the young American of today. The boy who, by his own ingenuity, constructs a workable wireless system from odds and ends obtained from the junk pile and other sources commonly known to most boys, has entered a modern fairyland of science which grips his imagination in a way that very few other things would. His numbers are legion.

Telephone Society of Boston, Mass.

The Telephone Society of Boston, Mass., listened to an address on November 21st by L. N. Whitney, general commercial superintendent, New England Telephone and Telegraph Company, on the subject of "A Business Opportunity for All of Us." The meeting took place in the Telephone Building at 6.30 o'clock in the afternoon and was well attended. Gordon S. Wallace, 125 Milk Street, Boston, Mass., is secretary of the Society.

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PERSONAL

ANDREW S. WEIR, of Philadelphia, was a New York visitor Thanksgiving week. He met many of his old friends while in the city.

J. H. FINLEY, merchandise sales manager of the Automatic Electric Company, Chicago, was a New York visitor on December 6th. Mr. Finley is well known in electrical circles and his numerous New York friends warmly greeted him.

C. H. BRISTOL, formerly general superintendent of construction of the Western Union Telegraph Company, New York, now retired, accompanied by Mrs. Bristol, is in Miami, Fla., for the winter months.

ARTHUR LOCKWOOD, known in the telegraph, telephone and electrical supply trade, has become identified with the well-known Whitall-Tatum Company of New York. For the past nine years Mr. Lockwood has been secretary, in charge of sales, of the Brookfield Glass Company.

POSTAL TELEGRAPH-CABLE COMPANY

EDWARD REYNOLDS, vice-president and general manager, accompanied by John F. Skirrow, chief engineer, recently spent a few days at Washington, D. C.

LEE ENRIGHT, for the past year attached to Secretary W. B. Dunn's office, has been appointed manager of the department of complaints and claims, succeeding the late John Doran. Prior to his transfer to Mr. Dunn's office Mr. Enright served in the complaints and claims department for a period of about eight years, and is, therefore, by long training eminently qualified to fill the duties of this exacting position.

New York City

PHILIP J. REBECCA, one of the promising young managers, who has charge of the new office at 26 Cedar Street, was married on December 3rd.

MISS Frances Montallo, day operator at the 1844 Broadway office, was married on December 7th.

CHARLES W. MANY, formerly a branch office manager, more recently connected with the United States Government Naval Radio Service, has again returned to the Postal as manager of the 624 Madison Avenue office.

THE new office of the company, located in Fordham, in the Roger's building, 2514 Webster Avenue, was officially opened for business on December 3rd. Jerome Conway is the acting manager.

MISS Agnes Stellhorn, a graduate of the telegraph school, has been assigned to the 356 East 138th Street office, as operator, in place of Jerome Conway, transferred to Fordham.

CHARLES ROMANO has been appointed chief operator of the 26 Cedar Street office.

EDWARD LAVER has been appointed operator at the 14 Desbrosses Street office, vice S. Seligman, resigned.

MISS Ruth Magin, formerly employed at the Cotton Exchange office, has been assigned to 624 Madison Avenue, as operator.

THE sympathy of the entire staff is extended to Night Manager Tierney in the death of his father.

J. C. BENNETT, formerly assistant city chief before the war, was a recent visitor.

MRS. F. Rigney, of the first Pittsburgh bonus, again leads the operators of that division in the number of messages handled without a single error or implication.

Philadelphia

THE many friends of Leo Miller, who was for a number of years Philadelphia correspondent of TELEGRAPH AND TELEPHONE AGE, will be glad to know that he is still as active as ever. Mr. Miller is in charge of the private pony wires.

FRANK K HOLTZINGER, who has been actively identified with this office for many years, during the past ten years as late night chief operator, is absent on account of ill-health. He is at present with his son, Rev. Horace K. Holtzinger, at Livingston, Montana.

M. N. REDDING, who succeeds F. K. Holtzinger as late night chief operator, has had a broad experience, which well fits him for his new duties. Wm. P. Bowers, formerly assistant traffic chief, has been appointed general traffic chief, and John E. Torpey has been promoted from the operating force as assistant traffic chief.

FRANK L. BAKER has resigned to go with Jones & Laughlin Steel Company. He is succeeded on the Cleveland bonus circuit by John J. Taylor.

JAMES J. OWENS has been transferred to Atlantic City and J. H. Martin, of Atlantic City, has been transferred to the Philadelphia operating force.

C. E. BAGLEY, Superintendent, Philadelphia, was an Easton, Pa., visitor recently.

Managers Appointed

BELLE R. MORGAN, Holland, Mich.; W. F. Bibb, Pueblo, Col.; A. Weaber, Bakersfield, Cal., and Grace Stafford, Lodi, Cal.

JOHN DORAN, superintendent of the claim department of this company, who had been in St. Vincent's hospital, New York, for the past two months, died on December 5th as a result of a serious operation. Mr. Doran was born at Fredericton, N. B., in 1850. He became an operator at St. John, N. B., at the age of seventeen, and soon developed into one of the finest telegraphers of his day. In 1869 he became a member of the Western Union Telegraph Company's cable staff in New York, and his beautiful pen copy was admired by the entire staff and the cabling public. It was Mr. Doran who was selected to work with Messrs. Snyder, Bedwin, Leslie, Kettles, and others, who were noted for their speed in transmission. In 1877 Mr. Doran became stenographer and private secretary to General Thomas T. Eckert, president of the Western Union Telegraph Company, and later

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Colonel Albert B. Chandler and William H. Baker of the Postal Telegraph-Cable Company. In 1889 Mr. Doran was appointed in charge of the claim department of the Postal Company, which position he held until the day of his death.

Praise for the Plant Department

It is a well-known fact that those who are entrusted with the maintenance of telephone and telegraph lines, commonly known as the plant department of a company, seldom receive the recognition that is due them on account of their loyal work, in the maintenance of communication under trying conditions.

At the recent meeting of the Magnetic Club, New York, J. J. Whalen, traffic manager of the Postal Telegraph-Cable Company, spoke eulogistically of the plant department of his company. Among other things, he said that the members of the plant department have the real heavy hard work to do. They are working day and night, in all kinds of weather, while as a rule the members of the traffic department and the commercial department are sheltered from the severe weather and hard conditions surrounding the linemen in their work of maintaining and restoring wires. We find them working nights, in rainy weather, and in cold weather when they have to contend with sleet storms and blizzards, in parts of the country where such storms occur, or we find them in mountainous regions, traveling on skis over snow under which the wires are at times buried. Again, we find them working under conditions where the chinooks descend on them without warning, and where they must protect themselves to avoid freezing to death. "Chinook," as you may know, is a term used to denote a very sudden drop in the temperature, where the thermometer may be above freezing point, and in a short time fall to 20 degrees below zero. These changes occur in the northwestern part of this country, and sometimes a lineman, in his efforts to get the wires up, has failed to heed instructions of the wire chief to return to the office, or seek shelter, and allowed his intense interest in the service to carry him on in his work of restoring the wires, and wandering around in snow storms has simply circled where no shelter was in sight, and fell exhausted and died. In the mountainous sections in the northwestern part of the United States the Postal company has established cabins along its lines, stocked with food, where in severe winter weather linemen find shelter and food.

In the southwestern part of the country linemen have their own troubles with sand storms, and in the swampy sections of combating the handicaps which the oak-moss falling on our wires, causes. To those who have not visited that part of the country, where this oak-moss grows, we would state that it is a growth on oak trees, about 50 feet in height and growing and growing until it touches water, and at times the ends loosen from the trees, allowing it to fall over the wires—and with one end in the water we have a heavy escape of current through the wire from this wet oak-moss. To overcome these difficulties, we have linemen who cover their lines in motor boats, and who, with the aid of a long-handled rake or pole remove the troublesome oak-moss from the wires.

In the northern sections of the country, which takes in the New England States and parts of the Middle Atlantic States, together with the Western States, the severe wind storms from the Atlantic Ocean and Great Lakes keep the linemen busy, particularly in the winter season.

From this brief description you will fully realize just what kind of work the members of the plant department are called upon to do, and how well they do it.

I might add that there are sections of our country—in Tennessee and Arkansas—where the linemen have to cover their lines at times on horseback, on account of the flooded condition of the country. The great interest of the plant department, that is, the station linemen, is shown where after each electrical storm they would come to their station to examine fuses and lightning arresters, to see it everything is O. K., and to restore fuses that may have blown as a result of the storm, and clean arresters and remove grounds from them which the lightning produced.

Commercial Cable Company

THE new cable steamer, *John W. Mackay,* built at Newcastle-on-Tyne, England, for the Commercial Cable Company, was launched on November 30th. The vessel is an oil-driven cable ship of a gross tonnage of 4,100. Her length is 360 feet, beam 48 feet; depth, 27 feet, triple expansion engines and four cable tanks. Miss Clare Blount, a friend of the Mackay family, christened the new cable steamer. The firm that built the ship, Swan, Hunter and Wigham Richardson Company, have already laid the keel for another cable steamer to be constructed for the Commercail Cable Company. Clarence H. Mackay, president of the company, sent the following cablegram: "Kindly express to all of the guests of our company the pleasure of the directors and the staff and of myself personally at their presence on the occasion of the launching of the *John W. Mackay.* I can wish no better luck for our new ship than that her career will be as illustrious and as successful as the good old *Mackay-Bennett,* which has labored so long and so faithfully in maintaining the cables of this company."

Serial Building Loan and Savings Institution

A meeting of the shareholders of the Serial Building Loan and Savings Institution will be held in the office of the Association, New York, on December 20th, at 5 p. m., for the purpose of nominating officers and directors for the ensuing year.

The annual meeting of the shareholders will be held at the same place on January 17th, 1922. Polls for the election will be open from 2 p. m. to 5 p. m.

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WESTERN UNION TELEGRAPH CO.

NEWCOMB CARLTON, president, and G. M. Yorke, vice-president, who have been in Europe on business for the past few weeks, are returning, Mr. Carlton having sailed on December 10th. Mr. Yorke will sail on December 17th.

J. C. WILLEVER, in charge of commercial, New York, returned to his office on December 12th after an extended business trip of several weeks, which took him as far as the Pacific Coast.

J. J. WELCH, general superintendent of traffic, New York, has returned from a business trip to Boston and Chicago.

New York City

An interesting and enthusiastic election of officers of Morse Local No. 101 was held on December 5th at 24 Walker Street. The following officers were elected: John J. Keefe, unanimously re-elected president; Gertrude A. McMullen, re-elected secretary-treasurer; grievance committee, John Cashman, Kathrine McNally and Chas. A. Kilfoyle. We wish to congratulate the Morse local on its wise selections, especially the president, who has had an extensive and varied experience in the telegraphic field and is well qualified to perform the duties of his office.

The following officers of Clerical Assembly No. 80, Association of Western Union Employees, have been elected for the year 1922: President, Wm. E. Fleming; secretary-treasurer, Alvin Scherb; grievance committee, Joseph A. Sposoto, chairman; Lillian Marck, Howard Smith.

JOHN J. CARROLL, aged sixty-two years, who was identified with the main office force, New York, for over forty years, and who was retired on pension three years ago, died on October 21st.

CHARLES S. SHIVLER, aged seventy-seven years, for about twenty-five years secretary of the American District Telegraph Company, New York, who retired from active service twenty years ago, died at his home in Brooklyn, November 27th. Mr. Shivler's telegraph service began during the Civil War on the Philadelphia, Wilmington and Baltimore Railroad, and after hostilities had ceased he was identified with several of the telegraph companies later consolidated with the Western Union Telegraph Company.

Lake Division

RECENT Chicago visitors were J. C. Willever, vice-president, New York, Division Traffic Superintendent J. P. Edwards of the Eastern Division, General Commercial Agent A. C. Kaufman of Vice-President J. C. Willever's staff, and Division Commercial Manager John Simmonds, of General Manager T. W. Carroll's office, and G. P. Brinkley, division commercial manager of the Gulf Division.

CREDIT Manager H. W. Baker has returned from an eastern trip to which his vacation period was devoted.

COMMERCIAL Agent J. A. Ek, who was detailed to Philadelphia during September and the early part of October, has returned to Chicago.

A. Z. HELDERMAN, former relief manager, has been appointed manager at Evanston, Ill., vice E. J. Sullivan, furloughed.

A. C. HASHEIDER, former manager at Ironwood, Mich., has been placed in charge at Oak Park, Ill.

THE many friends of Harold Grevin will be glad to learn of his appointment as district commercial manager in charge of Southern Illinois territory. Mr. Grevin was formerly clerk in Superintendent McGrath's office, and deserved this merited promotion. Mr. Grevin succeeds J. P. Glennan.

J. P. GLENNAN, former district commercial manager, is now in charge as manager at Freeport, Ill., former Manager Mease having suffered a slight paralytic stroke. This is Mr. Glennan's home city.

THE students recently enrolled in our new telegraph school at Rock Island are progressing nicely under the guiding hand of Manager Prater.

R. H. UNDERWOOD, manager of the Western Union training office at Niles, Mich., is recovering from an operation for appendicitis in the South Bend Hospital.

ROBERTSON THOMAS of Omaha, connected with General Manager Bradley's office, was a recent visitor to Niles. The Central Division contemplates the establishment of a training school within its territory, and Mr. Thomas is getting pointers at Niles.

MISS Mary Hammond Kavanaugh, of General Superintendent Taff's office, Washington, D. C., was a recent visitor at Chicago headquarters while enroute to the Northwest.

E. W. TITUS, manager at New Albany, Ind., was a caller at headquarters, Chicago, enroute to visit his son, Major Elton Titus, now an instructor in military tactics at one of the Iowa universities.

CITY Superintendent Scholl of Cincinnati, spent a few days with his father in Chicago during his vacation.

C. W. STEINHAUER, chief operator at Indianapolis, is receiving congratulations on his marriage, which occurred October 22nd, to Miss Genevieve Copeland, of that city.

MISS Delia LaRose, operator at Escanaba, Mich., is leaving the service. It is understood that she will be married soon.

Central Division

THE Central Division have established a managers' training school at Chillicothe, Mo., for the training of small office managers who have progressed in Morse telegraphy sufficient to enable them to handle a small office.

There will be a Morse class room, where students can keep up their Morse practice. Careful instructions will be given to switchboard work, general accounting and reporting, money transfer service, cable service, banking, development of business, and in fact every feature of present day telegraph methods will be taught.

Chillicothe was selected for this school by rea-

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son of the nominal living costs to students, and available suitable quarters. C. A. Butler, manager of the Chillicothe office was appointed instructor.

W. A. MORRISON, from General Manager Bradley's office at Omaha, was a recent week-end visitor in Kansas City.

W. J. DURAND, district commercial superintendent, Kansas City, has returned from a brief vacation in Wisconsin.

A NEW independent office has been opened at Eureka, Kansas, this being the seventh independent office established in Kansas during the past year, which were necessary to properly meet the demands of the rapidly growing telegraph business in that territory.

THE following changes in managers have been made: Miss G. F. Senger, appointed manager at Girard, Kan., vice Miss Fern Ohare, transferred to Beloit, Kan., vice Miss E. N. Wilson, transferred to Kingman, Kan., vice Miss Mildred Knoles, resigned. Miss Katherin Junkins has been appointed manager at Eureka, Kan.; C. A. Waymon, appointed manager at Humboldt, vice A. H. Stirnman, transferred to Anthony, vice Mrs. Jesse Wade, resigned.

The Late R. H. Bohle

By J. FRANK HOWELL, New York

The announcement of Rudolph H. Bohle's death in the December 1st issue of the TELEGRAPH AND TELEPHONE AGE, is remindful of how as a young man I floated in and out of St. Louis with more or less frequency so natural to a roaming disposition —encouraged by the demand for telegraphers in those days. Consequently, I became acquainted with Mr. Bohle, and found it an easy matter as well as a pleasure to keep him on my mailing and visiting list all through life.

His was a disposition that anyone would be proud to emulate. Among the small army of talent it was my privilege to mingle with since then and who knew him, I have heard many friendly remarks concerning Mr. Bohle. Indeed, he was just as popular outside of the ranks as he was esteemed within them. It was not surprising that his fellow men should hold him in high esteem. His manly and beautiful characteristics were so pronounced as to be most impressive.

Electrical Aid Society of Philadelphia

A special meeting of the Electrical Aid Society of Philadelphia was held on December 2nd, to take action on the death of Miss Eupremia E. Leishman, a charter member of this society, who died on December 1st. Miss Leishman was well known to many telegraphers in this and other cities, having worked on the principal wires of the Western Union Telegraph Company for more than thirty years. She took an active interest in the upbuilding of the present Aid Society from the date of its formation. In the death of Miss Leishman the Western Union Telegraph Company loses a valued employee and the Electrical Aid Society an untiring worker. A large number of telegraphers were present at her funeral, including the following: John A. Chapman, A. G. Strickland, F. E. Maize, J. H. Wilson, Earl W. Miller, W. E. Van Arsdall, Robert C. Murray, Mrs. Clara M. Hart, Miss May McFadden, Joseph E. Janney and Andrew S. Weir.

CANADIAN

THOMAS M. KANE, who for over thirty-seven years had been a familiar figure in and about the Kingston, Ontario, office of the Canadian National Telegraphs, and one of the most esteemed and trusted employees, died on November 22nd. That his passing was sudden is emphasized by the fact that it was some minutes before his associates realized that he had passed away. He had gone on duty as usual in the morning and was engaged in copying the Canadian press dispatches for the local papers. Shortly after eleven o'clock one of the office messengers noticed that he was lying over his typewriter, and he informed Mr. Hanley, the manager. Mr. Hanley immediately investigated and found that Mr. Kane was apparently unconscious. First aid was given and a physician hurriedly summoned, who after an examination announced that death had been instantaneous, resulting from an apoplectic stroke.

OBITUARY

ALVIN E. MASTEN, aged fifty-eight years, a well-known broker of Pittsburgh, Pa., died on November 23rd. Mr. Masten began his business career as a telegraph operator and was employed on railroads in Ohio and Pennsylvania, reaching the position of chief train dispatcher, as well as a commercial operator. He entered the brokerage business in 1888, since which time he had made a great success of his adopted field. At the time of his death he was a member of the Pittsburgh Trust Company, The Terminal Trust Company, and a member of the New York and Boston Stock Exchanges, the New York Metal Exchange, and the Chicago Board of Trade. He was active in many organizations and a member of the Union, Monongahela and Duquesne clubs.

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Commercial and Railroad Telegraphy, Telephony, Submarine Cables, Radio-Telegraphy

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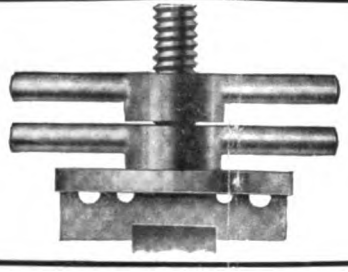

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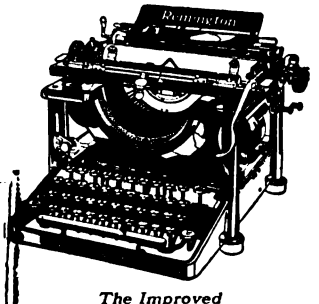

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ASSOCIATIONS AND ORGANIZATIONS

The Old Time Telegraphers' and Historical Association, B. E. Sunny, Chicago, president; Thomas E. Fleming, 195 Broadway, New York, secretary and treasurer. All Old Time Telegraphers who are eligible for membership are requested to send for application blanks and become affiliated with this excellent association. The next reunion, Chicago, Ill. Time to be selected later.

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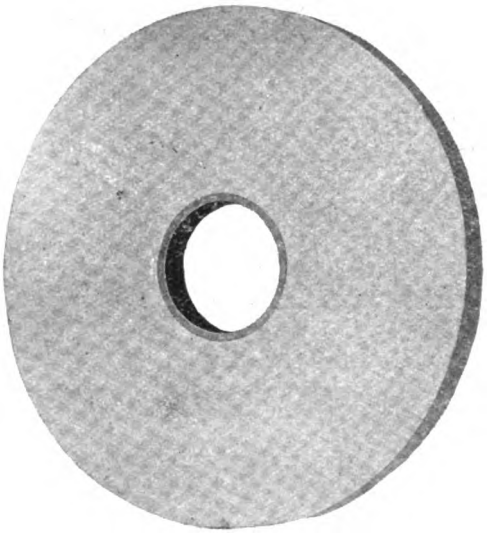
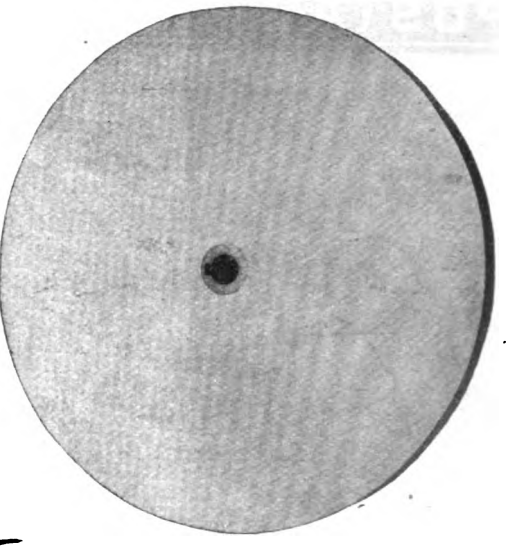
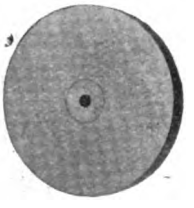
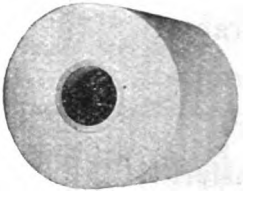

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There is a constant demand for all sorts of telegraph instruments, and this publication is prepared to fill orders for this class of goods the same day they are received if the goods are in stock. These include:

Dandy Learner's Set, 20 ohms, $4.00.
Dandy Learner's Set, 4 ohms, $3.80.
Beeko Learner's Instrument, 4 ohms (key and sounder combined on one base), $3.30.
Beeko Learner's Sets, 20 ohms, $3.50.
High Grade Key and Sounder on one base, 4 ohms $8.50.
High Grade Key and Sounder 20 ohms $8.80.
Double Speed Key, $5.00; with base, cord and wedge, $7.70.
Bunnell Legless Key, Best Grade, $3.20.
Dandy Key (cheaper grade), $1.50.
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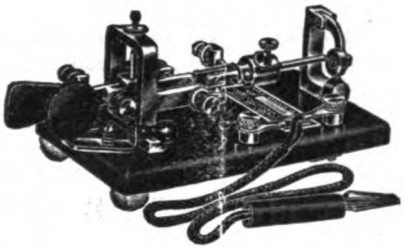

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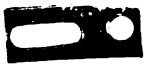

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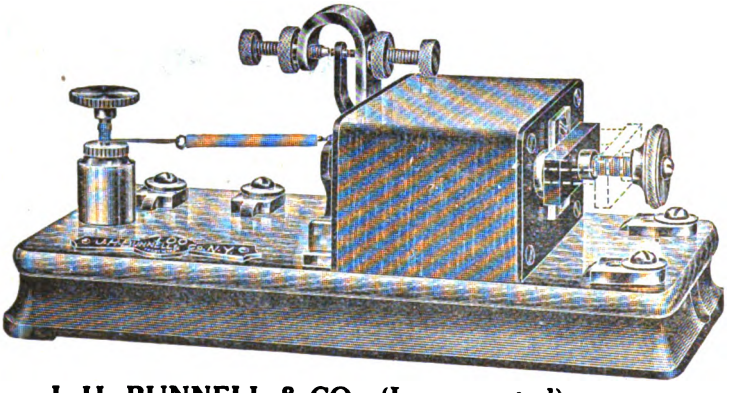

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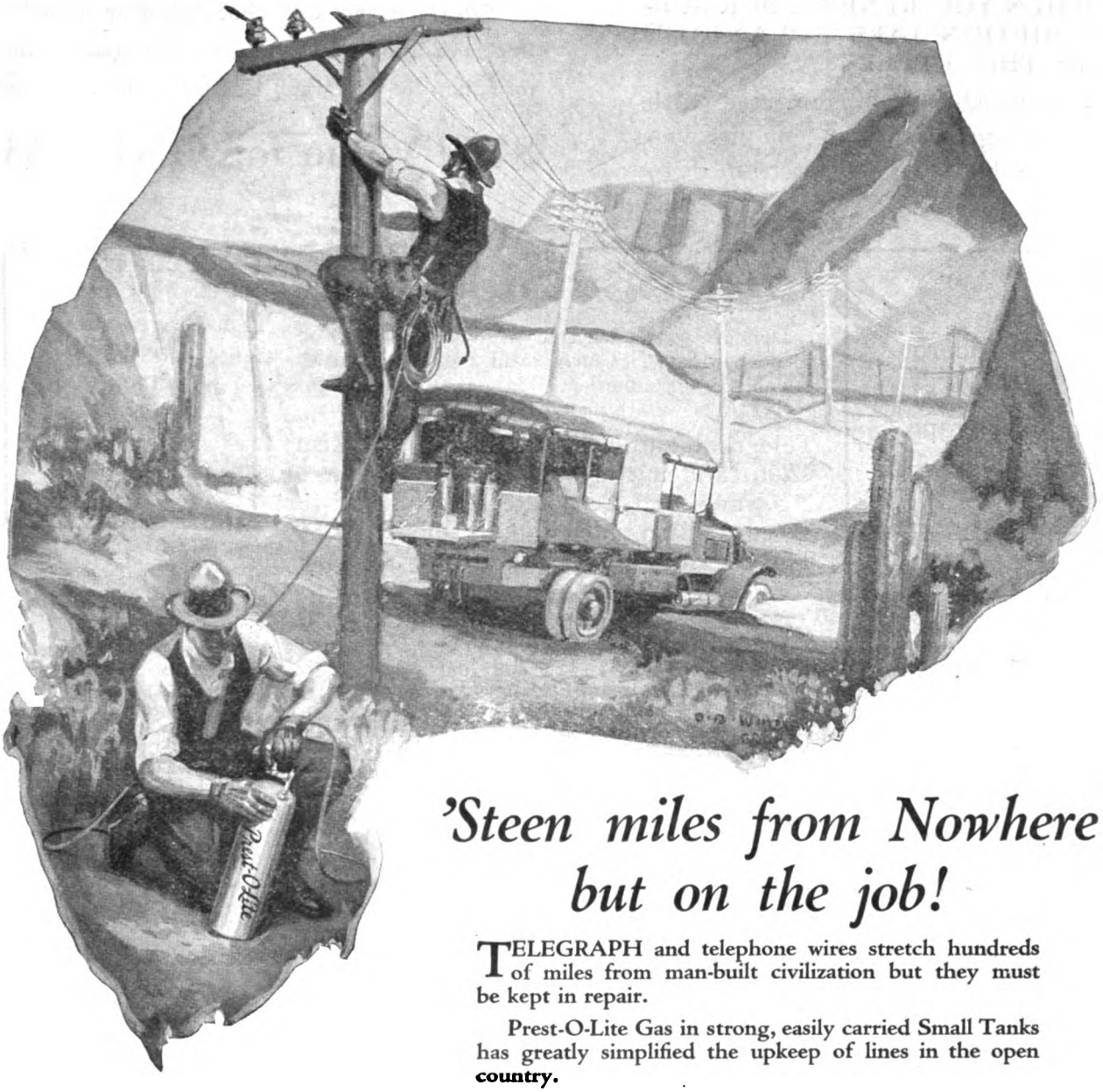

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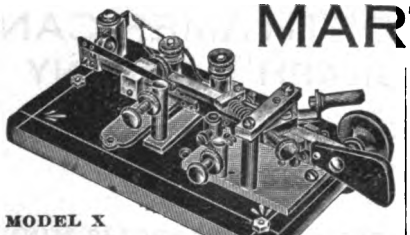

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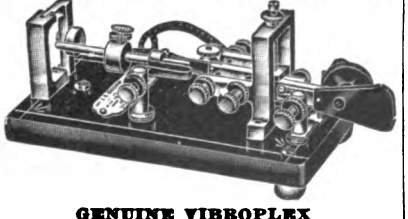

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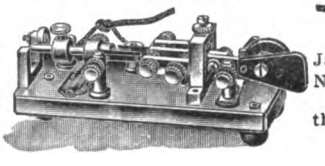

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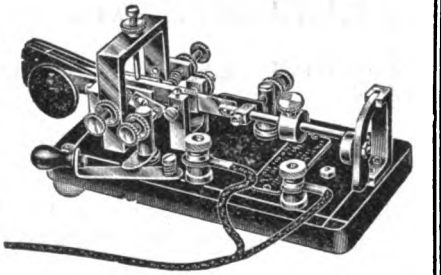

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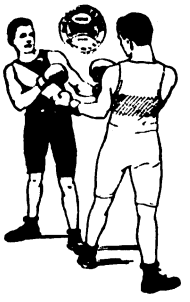

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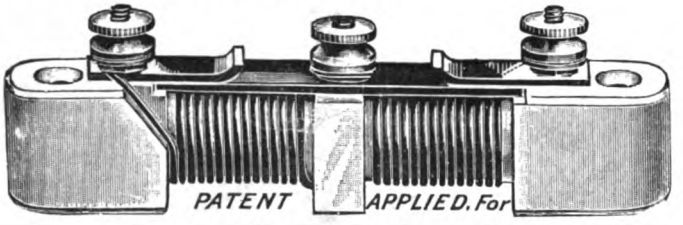

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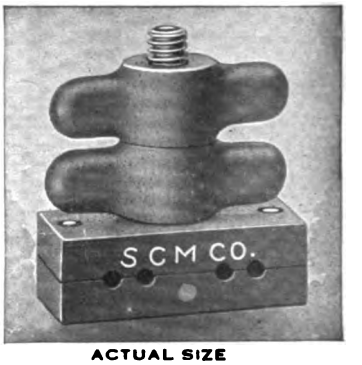

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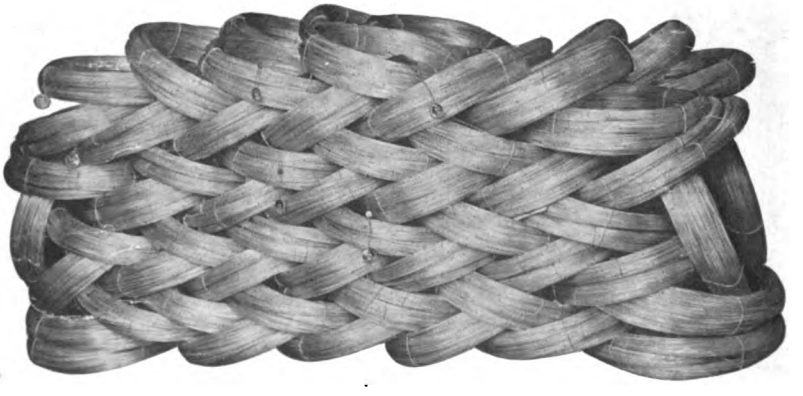

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